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UPBUILDING NATIONAL VITALITY—THE NEED FOR A SCIENTIFIC INVESTIGATION[1]

IF American democracy is to survive, it must be made more efficient—socially, industrially, politically. If Americans are to work out their national destiny unvexed and unhampered by foreign interference or domination, they must no longer endure the hazard of unguarded peace.

These conclusions—right or wrong—have been firmly fixed in the minds and hearts of a vast number of Americans.

For many months they have observed the great Christian nations of Europe rending one another with the ferocity of wild beasts—a savage, brutalizing struggle to destroy life and property, to increase human pain and suffering. The awful horror of it, the appalling cost of it in men, money and misery has passed beyond the grasp of the imagination.

Civilization's guarantees against such a man-made calamity have been dishonored, treaties torn up, the laws of common humanity and of God designedly outraged, and the rule of the sword substituted.

On one flank America has this extraordinary recrudescence of the spirit of national outlawry and conquest. On the other it has a rapidly advancing military power supported by an aggressive, warlike people with colonizing policies.

The possibility that American democracy may eventually be squeezed or crushed between these two great forces of militarism can no longer be ignored.

[1] Address of the chairman and retiring vice-president of Section I, the American Association for the Advancement of Science, Columbus, December 29, 1915.

Adequate national defense is the only answer to this extraordinary situation, and it must continue until the spirit of militarism and conquest is subdued in other powerful nations.

There are good-intentioned people who oppose this policy of national preparedness against war. For protection against a foreign foe they stand upon the theory:

In weakness there is strength.

They also tell us that our duty to the great brotherhood of man is higher than our duty to our country.

If we are worthy of belonging to the human species we must know that our first duty is to our own—to faithfully guard the lives and the happiness of that portion of the human family given into our care, and to religiously discharge our responsibilities as trustees for our own posterity.

However we may abhor war, it is a self-evident truth that to-day a nation without the will or the capacity to fight for its own peace, honor or national entity commands little respect at home or abroad. It has neither influence nor place in the councils of the world.

Our primary obligations to humanity and to posterity are to guard our national birthright now, and to hand down a race that will have, not only the will, but the physical power and endurance to defend and maintain our ideals, and our institutions in their full integrity.

TAKING STOCK OF NATIONAL VITALITY

Upon the health and strength of the people depend the safety of the state and the continued advance of our civilization.

With this important truth in mind, and also the constantly increasing demand for physical fitness of the individual in our industries as well as in war, let us consider some of the evidences of declining power of our people to endure the physical stress and strain of modern life.

We will then be able to appreciate the need of a national vitality commission to study and report upon the present physical status and trend of our people. Such a commission should be authorized by congress and appointed by the President and consist of, say, fifteen members selected from a list of our most eminent authorities in this field of science.

An official body of this character would command attention and confidence. It would not only enlighten the public, but it would stimulate to action our school and health officials, and the appropriating authorities back of them, in spreading knowledge of individual hygiene and healthful living generally. This would help to check both communicable and degenerative affections which are causing such an excessive drain upon national vitality.

If the state can teach us how to combat germ diseases (which it is doing), why not organic diseases, which are virtually all preventable or deferable?

THE DECLINING DEATH RATE

Modern progress has freed us from many mental and physical burdens. It has given us wealth, comforts, luxuries, pleasures and opportunities for gaining knowledge far beyond the dreams of our forefathers. It has removed many dangers from our paths and lengthened the average years of life, all of which we gladly acknowledge.

But we must also recognize that while American life strain has decreased in some respects it has increased in others. We must admit that our civilization, in addition to its blessings, has brought us habits and hazards of life and degenerative influences which promote physical deterioration.

Many people who give little thought to

this subject insist that there is but one side to the shield. They see only where American life strain has been reduced and resent as a species of treason any reference to adverse tendencies. Naturally, this results in misunderstandings and misinterpretations of simple facts.

For instance, the average person interprets the declining general death rate and the increase in the average years of life as a sign that the race is growing stronger, that its capacity to stand the stress of modern life is increasing. The fact is overlooked that the decline in the death rate in recent years is almost wholly due to the saving of lives in infancy, childhood and early adult life from the germ diseases. These diseases are really accidents. They are not the result of the wear and tear of life. The declining death rate means, then, not that we have grown physically stronger, but that we have learned to step around certain dangers.

The advance in medical science and in general intelligence is saving lives in all age periods. But this does not indicate any gain in our vital strength. In fact, the death rate in middle life and old age from the degenerative diseases has increased steadily for years.

Another factor that is often misunderstood is the effect of the survival of the weak. Formerly only the strong survived infancy. In the past thirty-five years many lives weakened by germ diseases have been saved, and when they have had time to reach age forty and beyond they will undoubtedly affect the death rate in that period. The increase which has already occurred in the mortality rate in that period must be charged to other causes.

This low-powered group will need careful health guidance to reach middle life and is obviously an element of weakness in the upbuilding of national vitality.

THE LOW-POWERED GROUP

We rejoice over our marvelous increase in wealth and in the wonderful development of time-saving and labor-saving devices, and we would not go back to the old living conditions if we could.

We must recognize, however, that these extraordinary changes in our methods of living during the past two generations have operated greatly to disturb our race stability.

Extravagance, luxury, nervous stress and an extraordinary increase in sedentary occupations have resulted, and caused a marked increase in American life strain. In our efforts to crowd a lifetime of work and pleasures into a few years we have developed in a large number of people the intense life with its excessive indulgence, its intemperate eating, drinking, playing and living generally.

The peril of our nation in this trend is obvious to every reader of history.

In the natural order of things, there are many millions of physically substandard people in our vast population. These extraordinary changes in living conditions have apparently caused an abnormal increase in this great group of low-powered Americans.

But whether or not this impaired element is increasing, there is no questioning the assertion that this drain on the vitality of the nation, now going on from preventable cause, is excessive and should and can be checked.

INFLUENCE OF EXCESSIVE INDIVIDUALISM

In the ultra-individualist we find selfishness in the most dangerous form. He views all things from the angle of his own comfort and pleasure. He has an overpowering sense of personal independence. He flouts things sacred and semi-sacred that tend to curb it. He freely defies the laws

of health. He resents restraint in any form. A self-worshiper, neither the *good* of the majority nor the *will* of the majority claims his allegiance. He is apt to fail his country in both peace and war. He has lost the "herd spirit." His patriotism has withered and vanished under the blighting influence of love of self and of personal ease. To what extent would those afflicted with all, or a part, of the weaknesses of this product of our civilization contribute to national defense and to upbuilding the moral, the civic or the physical fitness of the race?

To this selfish, lawless spirit of the ultra-individualist which in whole or in part prevails among so many of our people, we may reasonably charge our excessive murder and suicide rate, and our indifference to the increasing waste of life from preventable accidents and disease.

It is possible that the report of the broad investigation proposed would induce the American people to place a higher value on human life.

TIME-SAVING MANIA

As a contributing cause to nerve strain and physical deterioration, our time-saving mania must not be overlooked. Those afflicted with this modern malady avoid walking and every physical movement that is not strictly necessary. The hurry habit is so firmly fastened upon us that it has changed the poise and even the manners of a vast number of people.

Thus the habit has grown upon us to express ourselves in brief, incisive terms. Abruptness enters into our personal intercourse with relatives and friends. Old-time politeness and kindly consideration for the dignity and sensibilities of others in our public and business contact is sadly lacking in many of us. The traits of calmness and deliberation seem to be deserting us and in their place we have the imperative demand for hurried councils and quick judgments.

Our every need, our every sense must be served quickly or impatience and often rudeness follows. Much irritableness and bad temper are the natural consequences of such a life.

These and other habits of self-indulgence are affecting the mental poise and stability of the "strenuous" class, and largely account for the so-called "high nervous tension" under which they live. This is a serious form of life strain, and it is by no means confined to the business or well-to-do class.

This strain is bound to react sooner or later on the heart, arteries and kidneys, and especially upon the nervous system, adding to our already large family of neurasthenics. To what extent can we depend upon this particular element of our substandard citizens for the defense of the nation and the upbuilding of the race?

DISUSE OF LIMBS AND MUSCLES

The decline in physical activity has had an important bearing upon national vitality. We have millions of people, mostly bred from generations of outdoor or muscularly active ancestors, who are now working in offices, stores and the industries where little or no physical exertion or even concentration of mind is required.

It is no longer the rich who ride in "shayses." The wage-earner is whisked to and from work by electricity or gasoline. Instead of fabricating his output by physical toil, he fashions it by the simple process of feeding, watching, or adjusting a machine. A vast number of people in the rural sections, as well as in our cities, are earning their living with little or no muscular effort. This is a glorious advance over old methods, but there is the penalty. This change produces a constantly increas-

ing line of recruits for the low-powered or substandard group. Their limbs, joints and muscles were made to use. These naturally become soft and weak from disuse. To run three blocks would doubtless give the entire nation the "charley horse."

As time rolls on, the seriousness of this problem will increase, for the decline in our physical activity is bound to continue. Edison tells us invention, especially in electricity, is still in its infancy in developing time- and labor-saving methods.

OUR INDUSTRIAL ARMY

When men are wanted to fight for their country, the first consideration is health and strength of body. The initial requirement is to undergo a physical examination to determine their fitness for service. The weak are separated from the strong. The physically fit must do the fighting for the physically impaired.

And what of our great industrial army which makes the fighting army possible?

We not only have the communicable and occupational diseases and hazard of accident to combat in this group, but a marked increase in mortality from diseases of the heart and other important organs that bear the heaviest burden of life strain.

Based upon the experience of the Life Extension Institute, it is estimated that of the twenty-eight million men, age eighteen to sixty, in the United States, eight million five hundred thousand show evidences of approaching organic disease, or already have it in one or more forms.

This can only be checked and the average vitality of this group built up by teaching these people, and inducing them to observe, the laws of individual and household hygiene as applied to modern conditions. Is it not worth while?

If it is so important that our fighting men should be in good physical condition, is it not important that the great army of workers upon whose physical fitness, skill and loyalty the fighting army must depend for existence should also be considered in our plans for national defense?

Are we to depend upon weaklings and invalids alone to feed, clothe and equip the army in the field, and to provide it with ammunition and arms?

Governmental sick insurance for workers appears to be near at hand. Sick insurance is a great need, but this is not prevention. It is relief after the damage is done. Why wait until the victim is stricken with disease before teaching him how to avoid it?

It is to reduce this vast body of substandard Americans, who are physically unable to do their full share either in the defense or the progress of the nation, that a scientific inquiry under governmental control is urged. Surely the wisdom of such an inquiry should appeal to life insurance companies and industrial employers, as well as to our military authorities.

PHYSICAL DEVELOPMENT

It is gratifying to know that interest in athletics and outdoor life has increased in recent years. But, unfortunately, the active recruits to this class have apparently not increased in proportion to the gain in population.

The growing tendency toward habits of physical ease is a dangerous factor in our civilization. Even in our schools and colleges athletics are confined chiefly to a few enthusiastic well-trained individuals. The great majority of students do not take an active part even in mild physical exercises. Their interest is often keen, but their athletics as a rule are confined to clapping their hands and exercising their vocal cords at contests where the few entertain the many. Even where the best of instructors

and equipment are provided, there are large numbers who avoid gymnasium and outdoor work and stick to the lazy line of least exertion.

We do not want and could not have a nation of highly trained athletes. What we want is a race of people who stand erect, who have good, average physiques and sound organs. A national vitality commission could study and recommend the best means of teaching our people and of stimulating them to action in this vitally important matter of exercises, and especially of natural outdoor exercise.

HIGH-POWERED SOLDIERS

Modern methods of war call for the very highest state of physical efficiency on the part of the soldier. The strain upon the physique and the nervous system is excessive.

How would our sedentary group stand it? They would doubtless do their part well, if the enemy were sufficiently obliging to allow them time to drill and harden and restore their limbs and muscles to normal condition. As to their fitness, untrained, listen to a civilian member of the Plattsburg experiment of last summer, Mr. Ralph W. Page:

THE RAW RECRUIT

. . . We advanced at top speed for miles; we crawled over ten thousand acres, and we charged until dizzy all over the country. This, my friend, is no easy task. It gives you an abnormal aspect of the real fighting man. To advance a mile on your belly or by rushes carrying thirty-eight pounds besides shooting an eight pound rifle the whole way, after a long march, even when no burst of shrapnel enhances the entertainment, is very strenuous business. . . .

Now the very essence of this [military service] is physical condition. That as a nation we are not in such condition was very strikingly shown at the maneuvers. This Plattsburg regiment was recruited largely from athletes, polo and football players, militiamen, big game hunters, and such people probably far above the average of our citizens. They had a month's very vigorous training. And yet ten miles was the utmost limit they could cover as a body in march in one day. Yet the 30th United States Infantry two days before the amateur war began arrived at camp about 4:30 in the afternoon, the band playing "What the hell do we care," having covered thirty-two miles to a man since reveille.

If this is the experience of self-selected soldiers who undertook the work because they knew of their own trained physical condition, how long would it take to "rebuild" a regiment of men from our large body of untrained citizens composed partly of men from the great physically low-powered group?

ORGANIC DETERIORATION

Apparently the most significant result of the various changes in our living habits is found in our declining power to resist the strain of life on the heart, arteries, kidneys and the nervous and digestive systems.

Compared with past decades, the increase in mortality from the early breaking down of these organs is very marked. The records of the last census show that the increase continues in the younger as well as the older age groups. This points to the shortening of the valuable productive period of life. These indications are well attested. They can not be disposed of by the easy process of denying the statistics without investigation. Nor can the extraordinary increase in cancer be explained in this convenient way.

The early breaking down of these important organs points to a decline in the vitality of our people in the mature and most useful period of their lives, and presents a phase of the problem meriting the most careful study and consideration.

THE DECLINING BIRTH RATE

That our birth rate is declining is freely conceded. The ratio of decrease we do not

know, as we have not yet reached that stage of intelligence which grasps the importance of keeping a record of the births and deaths in all sections of our country.

We know that we have made a great advance in conserving infant lives. Therefore, it may be said that if our rapidly developing civilization has operated to reduce the birth rate, it has also provided us with life-saving methods to offset the loss. But the indications are that this gain in this baby-saving is not sufficient to offset the decline in the birth rate.

The vital importance of the birth trend as a national problem is emphasized by the growing practise of birth control by parents, and by the indifference of so many of our young people to marriage. What we need is not necessarily larger families, *but more* families. The proportion of married people should have greatly increased under our new civilization. A large proportion of our 17,000,000 unmated men and women should be married. The divorce habit should have declined, but it has grown to astonishing proportions. These are all recognized facts and have a very direct bearing upon the problem of race survival, both as to quality and quantity.

Eugenics—the improvement of the breed—and the general question of race protection should receive national recognition and a sincere effort should be made to impress the public with their true purpose and importance.

WHY A NATIONAL VITALITY COMMISSION IS NEEDED

To summarize:

National liberty rests upon national vitality. The health and strength of the people are therefore fundamental factors in national defense.

Neither our freedom nor our race can be protected and developed by weak-limbed, soft-muscled, low-powered men.

Notwithstanding our progress in prevention, the physically substandard and low-powered group, which numbers millions, is apparently increasing abnormally.

The decline in the general death rate and the increase in the average length of life is due, not to an increase in the vital strength of the people, but to the fact that we are learning how to step around certain dangers—the germ diseases. The death rate from the wearing out of the organs is steadily increasing.

Some of the conditions and reasons justifying the appointment of a scientific commission to investigate and report on the trend of national vitality may be found in the following

BILL OF PARTICULARS

1. Our unprecedented prosperity and invention of labor- and time-saving devices have developed habits of extravagance, luxury, over-indulgence in both work and physical ease, which have disturbed our race stability.

2. The high-tension element is obviously increasing. Nervous strain and mental stress are constantly adding to low-powered group.

3. An extraordinary increase in sedentary life has occurred.

4. The overfed and under-exercised groups are increasing. Result: obesity and weak limbs, soft muscles—due to disuse. Easy and early victims of organic disease.

5. Prevalence of defective teeth, diseased gums (largely due to non-use of teeth), impaired vision, baldness, bad posture, flat-foot, constipation, increased by sedentary occupations.

6. A marked increase has occurred in the death rate from diseases of the nervous and digestive systems, heart and arterial system, kidneys and urinary system—19 per cent. in ten years.

7. At least 8,500,000 men (of total 28 million) age eighteen to sixty have evidences of approaching organic disease or already have it in one or more forms.

8. Health and life waste from tuberculosis, typhoid fever and other germ diseases is still excessive; about 350,000 deaths annually.

9. The mortality from cancer is rapidly increasing. Annual deaths about 75,000.

10. Accidental deaths have steadily increased and now number nearly 90,000 annually.

11. Four out of every ten deaths (all causes) are preventable.

12. Two billion dollars is the estimated annual economic waste due to preventable sickness and preventable deaths in the United States.

13. The birth rate is steadily declining—especially among the well-to-do classes—and at least 200,000 babies die every year from preventable disease.

14. There are 9,000,000 unmarried women and 8,000,000 unmarried men in the United States.

15. The divorce rate is increasing. In Chicago one suit is filed for every six marriage licenses issued.

16. Not less than 75 per cent. of school children need attention for physical defects or impairments prejudicial to health.

17. The large number of mental defectives and backward children in our schools presents a serious educational problem.

18. Idiocy and insanity are apparently increasing.

19. An enormous number of people are suffering from drug habits and alcoholism. The use of cigarettes has doubled within the past five years.

20. Medical men claim that victims of venereal disease are rapidly increasing.

21. Suicides continue to increase and have now reached the enormous total of over 15,000 annually. In ten years, 42,000 people have taken their lives in 100 cities.

22. America's murder rate is extraordinary. About 80 per million as against 7 to 20 for other nations. But a small number are punished for their crimes.

The adverse influence of this great body of physical and mental defectives upon the material, intellectual and moral advance of the nation, and upon the quality of present and future citizenship is self-evident.

We have made wonderful progress in fighting germ diseases, but no war is waged against organic diseases.

If the government may teach people sanitation—public hygiene—why not individual hygiene—the care of the body and its organs?

If it is a good thing to teach children to avoid illiteracy, why not how to avoid ill health?

If it pays to medically examine our soldiers periodically, why not teach the people to adopt the same health- and life-saving practise?

If we can afford to investigate the condition of swine and cattle, and of rivers and harbors for purposes of improvement, surely congress can afford to provide this National Vitality Commission to improve human efficiency and to save human life.

The primary duty of organized society is to guard the health and lives of those who compose it.

E. E. Rittenhouse
Life Extension Institute

THE REVISION OF EOANTHROPUS DAWSONI

The prehistoric archeologist sometimes uncovers strange bedfellows; no other discovery is quite so remarkable in this respect as the assemblage from the now famous gravel pit at Piltdown Common, Sussex, England. Nature has set many a trap for the scientist; but here at Piltdown she outdid herself in the concatenation of pitfalls left behind. Parts of a human skull, half of an ape-like lower jaw, a canine tooth also ape-like, flints of a pre-Chellean type, fossil animal remains, some referable to the Pliocene, others evidently Pleistocene; all at least as old as the gravel bed, some of the elements apparently derived from a still older deposit.

Has not this dazzling combination blinded the discoverers and indirectly some of their colleagues even at a distance, because of the high pitch of expectancy to which recent discoveries in the prehistoric field have, not without reason, contributed? Under the circumstances, such blindness if only temporary would be pardonable and comparatively harmless; but serious danger lurks in the possibility of its persisting long enough to become an obsession and a hindrance to future progress in this particular field.

All the cranial fragments, including the nasal bones, are human and belong evidently to the same individual. They were however so incomplete as to leave room for a difference

of opinion especially in regard to the capacity of the brain-case. Authorities are quite generally agreed that the cranium as well as the brain embodied certain primitive characters, even though the brow-ridges were smaller and the forehead less retreating than in Mousterian man (*Homo neandertalensis*).

When it came to fitting the fragmentary lower jaw to the cranium, difficulties multiplied; it was the right half of the mandible, and the articular condyle was missing. Even had it been present, there was no right glenoid fossa to receive it. However a part of the left temporal bone, including its glenoid fossa, had been preserved, but it was typically human. The lack of the parts necessary to bring the mandible and cranial base into actual contact served to cloak the lack of harmony existing between the two. This lack of harmony was likewise further obscured by the incompleteness of the symphyseal region.

The proximity of the brain-case and lower jaw in the gravel bed, their apparent agreement in size and the non-duplication of parts present; the fact that they bore the same marks of fossilization, showing "no more wear and tear than they might have received *in situ*"; the failure of previous discoveries to confirm the presence of higher apes among European Pleistocene faunas; and perhaps above all the belief that a "generalized type" had been found led inevitably to the association of cranium and mandible as parts of one individual or species. Was such a conclusion the only logical one; was it even scientifically justifiable?

In dealing with the contents of a gravel bed, it is easy to overestimate the importance of proximity. Had Piltdown been a cave deposit or a camp site, the case for proximity might have been somewhat stronger; even in these there is abundant opportunity for chance association. In any event association can never be made to take the place of articulation; and so far as Piltdown is concerned, nothing short of the actual articulation of the mandible with the skull should have sufficed to outweigh the lack of harmony existing between these parts.

The only course to pursue then is to study the parts separately, classifying each on its own merits just as if the mandible had been found at Piltdown and the brain-case in a similar deposit somewhere else in Sussex. When this is done, the problem is at once clarified and there appears a solid foundation on which to build. Viewed in this light, the lower jaw is not only no longer human, it does not belong even to a generalized type. In justice to Dr. A. Smith Woodward and his highly meritorious researches, it should be acknowledged before proceeding further that no one has given a more exact description of the Piltdown mandible than he; for he was the first to point out its resemblance to that of a chimpanzee and added: "It seems reasonable to restore the fossil on this model." Thus far he was on safe ground; but instead of stopping there, he completed the sentence with: "and make the slope of the bony chin intermediate between that of the adult ape and that of *Homo heidelbergensis*." This proved to be the parting of the ways; for after a further description of both cranium and mandible, we find the following:

> The specimen therefore represents an annectant type, and the question arises as to whether it shall be referred to a new species of *Homo* itself, or whether it shall be considered as indicating a hitherto unknown genus. The brain-case alone, though specifically distinguished from all known human crania of equally low brain-capacity, by the characters of its supraorbital border, and the upward extension of its temporal muscles, could scarcely be removed from the genus *Homo;* the bone of the mandible so far as preserved, however, is so completely distinct from that of *Homo* in the shape of the symphysis and the parallelism of the molar-premolar series on the two sides, that the facial parts of the skull almost certainly differed in fundamental characters from those of any typically human skull. I therefore propose that the Piltdown specimen be regarded as the type of a new genus of the family Hominidæ, to be named *Eoanthropus* and defined by its ape-like mandibular symphysis, parallel molar-premolar series, and narrow lower molars which do not decrease in size backwards; to which diagnostic characters may probably be added the steep frontal eminence and slight development of brow-ridges.

The species of which the skull and mandible have now been described in detail may be named *Eoanthropus dawsoni,* in honor of its discoverer.

From the start there were not lacking those who hesitated to accept the cranium and mandible as belonging to the same individual. This was the stand taken by Sir Ray Lankester on the occasion of the first report of the discovery before the Geological Society of London in December, 1912. On the same occasion Professor Waterston was even more emphatic, saying it was very difficult to believe that the two specimens could have come from the same individual, since the mandible resembled that of a chimpanzee, while the skull was human in all its characters. In a later paper on the Piltdown mandible,[1] he concludes that referring the mandible and cranium to the same individual would be equivalent to articulating a chimpanzee foot with the bones of a human thigh and leg.

Objections soon came also from France and Italy. Basing his opinion on the cranial characters, Dr. R. Anthony[2] thought the specific name should have been *Homo dawsoni* instead of *Eoanthropus dawsoni.* About the same time a similar conclusion was reached by Dr. V. Giuffrida-Ruggeri. To Professor Marcellin Boule,[3] the Piltdown mandible is exactly like that of a chimpanzee; so that if this mandible had been found alone in the gravels of Piltdown associated with remains of Pliocene animals, it would certainly have been called *Troglodytes dawsoni.* Without rejecting Smith Woodward's interpretation, which Boule considers to be within the realm of the possible, even of the probable, it would nevertheless seem to him prudent to leave the matter still open. He objects to the choice of the name *Eoanthropus,* and finally in his judgment Woodward's restoration does not ring true (*elle sonne faux*).

It was this false note that impressed me most of all on seeing the restoration for the first time. The inherent difficulty in making Dr. Woodward's restoration ring true rests on the attempt to adjust parts that were never intended for each other. This would seem to have been demonstrated to an absolute certainty by Dr. Gerrit S. Miller[4] of the United States National Museum. He has compared the cast of the Piltdown mandible with casts of chimpanzee mandibles mutilated in the same manner, and finds not only similarity, but absolute identity. During the month of December, 1915, the writer was in Washington and examined the material on which Miller bases his conclusions, conclusions from which it would seem impossible for any one to escape, who approaches the question with an open mind. In an article on "Recent Progress in Vertebrate Paleontology," which appeared in Science[5] after the present article was begun, one of the joint authors, Dr. W. D. Matthew, says that Dr. Miller's "argument is convincing and irrefutable." The ape-like canine tooth found at Piltdown by Father Teilhard and referred by Woodward to the right side of the lower jaw, is considered to be the left upper canine by Miller, who thus agrees with the views previously expressed by Mr. A. E. Anderson and Dr. W. K. Gregory.

Regarding the Piltdown specimens then, we have at last reached a position that is tenable. The cranium is human as was recognized by all from the beginning. On the other hand, the mandible and the canine tooth are those of a fossil chimpanzee. This means that in place of *Eoanthropus dawsoni* we have two individuals belonging to different genera, namely: (1) *Homo dawsoni,* and (2) *Troglodytes dawsoni* as suggested by Boule, or *Pan vetus,* sp. nov., if we adopt Miller's nomenclature.

Such a revision does not by any means minimize the importance of the Piltdown discovery. On the other hand it contributes to our knowledge of the fossil fauna of the period in question by the addition of the chimpanzee to the list. As for the Man of Piltdown, he still exists and is quite as ancient as he was before the revision, which is saying a good deal; even if he is robbed of a muzzle that ill became him.

[1] *Nature,* November 13, 1913.
[2] *Rev. anthropologique,* September, 1913.
[3] *L'anthropologie,* Jan.–Avril, 1915.
[4] "The Jaw of the Piltdown Man," Smithsonian Misc. Colls., Vol. 65, No. 12, November, 1915.
[5] January 21, 1916, p. 107.

The only thing missing is *Eoanthropus,* and since he was never there anyway, the loss is small; besides, we can well afford to continue our search and live in the hope that he may be caught next time. Meanwhile the restorations by Woodward, McGregor and others may still serve a more or less useful purpose as substistutes for *Eoanthropus* until he shall have been found.

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NEW HAVEN, CONN.

PROVISION FOR THE STUDY OF MONKEYS AND APES

BIOLOGISTS are generally agreed that the study of the primates, and especially of the monkeys and anthropoid apes, is of extreme importance. It is evident that this work, nevertheless, has been neglected. We have but fragmentary and unsatisfactory knowledge of the structure and development (gross anatomy, histology, embryology) of most of the primates; we know less, definitely, concerning their physiological processes, diseases and pathological anatomy; still less, of the phenomena of heredity and of their life history; and next to nothing, with certainty, concerning their instincts, habits, other individual modes of behavior, mental life, and social relations.

The reasons for this ignorance where knowledge might reasonably be expected are not difficult to discover. Most investigators are either impelled or compelled by circumstances to work on easily available and readily manageable organisms. Many of the primates fail to meet these requirements, for they are relatively difficult and expensive to obtain by importation or breeding, and to keep in normal condition. It is clear from an examination of the literature on these organisms and a survey of the present biological situation that the neglect by scientists of systematic study of all of the primates excepting man is due, not to lack of appreciation of their scientific value, but instead, to technical difficulties and the costliness of research.

For hundreds of years men have been interested in the various types of lower primates and have more or less casually and incidentally studied aspects of their lives. But thus far there has been no definite plan or program for the systematic and continuous study of these animals. In view of the obvious and urgent need of such a program for research which is admittedly of practical as well as theoretical importance I venture to present to my scientific colleagues the following briefly sketched plan.

There should be provided in a suitable locality a station or research institute which should offer adequate facilities (1) for the maintenance of various types of primates in normal and healthy condition; (2) for the successful breeding and rearing of the animals to many generations; (3) for systematic and continuous observation under reasonably natural conditions; (4) for experimental investigations from every significant biological point of view; (5) for profitable cooperation with existing biological institutes or departments of research throughout this country and the world.

The institute should be located in a region whose climate is in high degree favorable to the life of a variety of lower primates and to man. It is eminently desirable to avoid, in the interests of scientific achievement, an enervating tropical climate and unnecessary isolation from civilization and from centers of scientific activity. Since it is probably impossible to find a location which would be ideal for both subjects and observers, it will doubtless prove necessary to sacrifice in a measure the interests of each. During the past three or four years, I have accumulated information bearing on the several problems involved in the locating of an anthropoid station and have had opportunity to prospect for such an institute in widely separated regions. Chief among the regions considered are Borneo, Hawaii, southern California, Florida, the Panama Canal Zone, Jamaica and the Canary Islands. Of all of these, southern California seems at present most promising, and although it is not perfectly certain that any or all of the anthropoid apes can be successfully bred there (various other primates

can be kept and bred successfully), it seems eminently desirable to test the matter thoroughly before locating an institute in any less accessible or climatically less favorable part of the world.

Given adequate provision in the shape of a scientific establishment for the study of the primates in their relations to man, the following program might be carried out: (1) systematic and continuous studies of important forms of behavior, of mind, and of social relations; (2) similar studies of physiological activities, normal and pathological, with adequate provision for medical research; (3) studies of heredity (genetics), life history, embryology; (4) research in comparative anatomy, including gross anatomy, histology, neurology and pathology.

Each of these several kinds of research should be in progress almost continuously that no materials or opportunities be needlessly wasted. It would be necessary to provide, first of all, for those functional studies which demand healthy and normally active organisms whose life history is known intimately and completely. Simultaneously with observations on behavior, instinct and social relations, and often upon the same individuals, genetic experiments could be conducted. After the usefulness of an animal in these psychological, behavioristic, or genetic lines of inquiry had been exhausted, it might be made to render still further service to science in various medical, physiological or pathological inquiries. And finally, the same individual might ultimately be used for various forms of anatomical research. Thus the usefulness of a lemur, a monkey or an ape, as research material, might be maintained at a high level throughout and even beyond the period of its life history, that is, for several years.

The necessity of some such economical use of primate materials as has been suggested is due, clearly enough, to the high cost of breeding and maintaining the animals. It would be inexcusably wasteful to maintain a primate or anthropoid station for psychological observations alone, or indeed for any other narrowly limited biological research.

The establishment under consideration should be permanent, since for many kinds of investigation it would be necessary that the life history of individuals be intimately known for many generations. With the lower primates, a generation might be obtained in two to five years; with the higher, not more frequently than ten to fifteen years. It is therefore probable that the value of the work done in such an institute would continue to increase for many years and would not reach its maximum short of fifty or even one hundred years. Ultimately, the interests of the institute might come to include other organisms in addition to the primates, and thus in the end, the most varied sorts of biological information might be brought to bear, from the broadly comparative point of view, upon the problems of human life. This would mean a gradual transformation of what was originally founded as a station for the special study of the primates into an inclusively psycho-biological institute.

Adequate provision in a research institute for the study of the various types of primates would demand a staff of several highly trained and experienced biologists. The following organization is suggested as desirable, although, as indicated below, not necessarily essential in the beginning: (1) an expert especially interested in the problems of behavior, psychology and sociology, with keen appreciation of practical as well as of theoretical problems; (2) an assistant trained especially in comparative physiology; (3) an expert in genetics and experimental zoology; (4) an assistant with training and interests in comparative anatomy, histology and embryology; (5) an expert in experimental medicine, who could conduct and direct studies of the diseases of man as well as of the lower primates and of measures for their control; (6) an assistant trained especially in pathology and neurology.

To this scientific staff of six highly trained individuals there should be added a business manager, a clerical force of three individuals, a skilled mechanician, a carpenter, and at least four laborers.

The annual expenditures of an institute with such a working staff would, in Southern Cali-

fornia, approximate fifty thousand dollars. It would therefore be necessary that it have an endowment of approximately one million dollars.

In the absence of this foundation, it would of course be possible to make a reasonably satisfactory beginning on the work which has been outlined in the following less expensive manner. A working plant might be established, on ground rented or purchased at a low figure, for about ten thousand dollars; the salary of a director, his assistant, a clerical helper, and combined mechanic and laborer might be estimated at the same figure; the cost of animals and of maintenance of the plant would approximate five thousand dollars. Thus, we should obtain as an estimate of the expenditures for the first year twenty-five thousand dollars. Without expansion, the work might be conducted during the second year for fifteen thousand dollars, and subsequently it might be curtailed or expanded, resources permitting, according as results achieved and in prospect justified.

An institute established on such a modest basis as this still might render largely important scientific service through its own research and through organized cooperation with other existing research establishments. Thus, for example, supposing that behavioristic, psychological, sociological and genetic inquiries were conducted in the institute itself, animals might be supplied on a mutually satisfactory basis to institutes for experimental medicine, for physiological research, and for anatomical studies. Under such conditions, it is conceivable that extremely economical and good use might be made of all the available primate materials. But it is not improbable that even cooperative research would prove on the whole more profitable, except possibly in the case of morphological work, if investigators could conduct their studies in the institute itself rather than in distant laboratories. In any event, the idea of cooperation should be prominent in connection with the organization of a research station for the study of the primates. For thus, evidently, scientific achievement in connection with these important types of animal might be vastly increased over what would be possible in a single relatively small institution with a limited and necessarily specialized staff of workers.

Finally, I wish to emphasize the important relations of the plan which I have outlined to strictly human interests and problems. It is eminently desirable that all studies of infra-human organisms, and especially those of the primates which are most similar, structurally and functionally, to man, should be made to contribute to the solution of our own intensely practical, medical, social and psychological problems. During our own generation, it has been amply demonstrated that knowledge based upon observation of other organisms may be of extreme value to man, and there is every reason to suppose that the solution of many of the most interesting and pressing problems of experimental medicine, of human genetics, physiology, psychology, sociology and economics may be solved, at least in large measure, most directly and economically through the use of the monkeys and anthropoid apes.

Were I required to designate the chiefly significant points of contact between studies of the lower primates and practical endeavor toward human betterment, I should name the medical, the sociological, and the psychological. For I am wholly convinced by my own experience as well as by that of others that the various medical sciences and medical practise have vastly more to gain than has yet been achieved, or than any considerable number of medical experts imagine, from the persistent and ingenious use of the monkeys and anthropoid apes in experimental inquiry. Likewise, I am convinced that education and all other forms of social service will profit immeasurably from experimental studies of the fundamental instincts of the other primates and from thorough investigation of the forms of habit formation and of the characteristics of social relations. And last, but not least important, it is safe to assume that our genetic psychology as well as other historical or genetic forms of biological description may be developed more rapidly and satisfactorily by the thorough

study of the monkeys, apes and other primates than by any other means.

It does not seem extravagant to claim that the securing of adequate provision for the systematic and long-continued study of the primates is by far the most important task for our generation of biologists, and the one which we shall therefore be most shamed by neglecting. But it is also a task which, as history clearly indicates, will not be accomplished unless we devote ourselves confidently and determinedly to it, with faith, vision and enthusiasm. For my own part, I am so entirely convinced of the scientific importance and human value of this kind of research that I am willing to devote my life wholly to it.

If we are to progress beyond the present narrow limits of our knowledge of the lower primates and make them contribute importantly to human welfare, it must be through adequate provision for their systematic study. I have presented to my fellow biologists a plan in the hope that their interest, criticisms, and support may ultimately lead to excellent facilities for this work, if not to the realization of the particular plan in question.

Robert M. Yerkes

Harvard University

SCIENTIFIC NOTES AND NEWS

The forty-fifth anniversary of its establishment was celebrated on February 9 by the United States Bureau of Fisheries, with the unveiling of a tablet in memory of its founder, Spencer Fullerton Baird, presented by his associates and followers. Professor Edwin Linton, of Washington and Jefferson College, presented the tablet, and Mr. Edwin F. Sweet accepted it on behalf of the Department of Commerce. The bronze tablet bears a bas-relief of Professor Baird with the inscription:

> He devoted his life to the public service and through the application of science to fish culture and the fisheries gave his country world-wide distinction.

The Albert medal of the Royal Society of Arts has been presented to Sir J. J. Thomson, "for his researches in chemistry and physics and their application to the advancement of arts, manufactures and commerce."

The fifth annual dinner of the Columbia University Biochemical Association took place on February 10, at the Hotel Majestic, with about 250 members and guests present. Dr. A. B. Macallum, professor of physiology at the University of Toronto, was the guest of honor, and made the principal address.

Professor Samuel Wendell Williston, of the department of paleontology at the University of Chicago, has been elected a fellow of the American Academy of Arts and Sciences.

William H. Burr, professor of civil engineering in Columbia University, retires from active service at the close of the present academic year.

At the annual meeting of the Royal Meteorological Society on January 19 the Symons memorial gold medal was presented for transmission to Dr. C. A. Angot, of the French Meteorological Bureau.

Professor Ayres Kopke, of Lisbon, has received the prize offered by the Sociedade de geographia of Lisbon for the best work by a Portuguese writer on sleeping sickness.

The Academy of Sciences at Vienna has granted a further subsidy of $960 to Professor R. Pöch to continue his anthropologic measurements and photographing of the various ethnologic types among the prisoners of war.

The Tri-State Medical Society of Arkansas-Louisiana-Texas has awarded the gold medals for the three best papers on original research work presented to the society, as follows: first prize, Dr. Thomas E. Wright, Monroe, La.; second prize, Dr. Herbert L. McNeil, Galveston, Texas, and third prize, Dr. Truman C. Terrell, Fort Worth, Texas.

The *Journal* of the American Medical Association states that Dr. Richard P. Strong has accepted the position of vice-president to the American International Corporation. This corporation recently formed with a capital of fifty million dollars is designed to explore, purchase or lease, lands and mercantile business in any part of the world. Dr. Strong will

attend to the sanitation districts in which the company's development work is situated.

DR. J. J. TAUBENHAUS, associate plant pathologist of the Delaware Agricultural Experiment Station, has accepted a position of head plant pathologist and physiologist at the Texas Agricultural Experiment Station.

PROFESSOR V. L. KELLOGG, who has been serving as a director of the Belgium Relief Commission in Brussels during the last eight months, has returned to take up his work at Stanford University. His position with the commission is now being filled by Professor Frank Angell.

H. H. WHETZEL, of the department of plant pathology, Cornell University, has gone to Porto Rico to study fungi and plant diseases.

MICHIYA HIRAOKA, professor in the Technical High School of Osaka, and Professor Wakamatsu Yokoyama of Port Arthur, are specializing in mining and metallurgy at the Massachusetts Institute of Technology.

PROFESSOR MILTON J. ROSENAU, of Harvard University, will deliver the Harrington lectures at the University of Buffalo Medical School during the alumni reunion, May 30, 31 and June 1. The subjects will be as follows: Two lectures on "Anaphylaxis" and one on "Education for Public Health Service as a Career."

THE Infants' Hospital, adjacent to the Harvard Medical School, has been formally opened. The speakers were Dr. Charles W. Eliot, president emeritus of Harvard University; Drs. J. Collins Warren, John Lovett Morse and Clarence J. Blake.

M. MAURICE CAULLERY, exchange professor from the University of Paris at Harvard University, has begun in French courses on "The Present State of the Problem of Evolution" and "Biological Problems and Sex."

PROFESSOR L. R. ABRAMS, of Stanford University, has been giving Professor Jepson's course in dendrology at the University of California during the first semester.

A COURSE of six lectures on early American geology is being delivered by Dr. George P. Merrill, head curator of geology, United States National Museum, before the department of geology, Columbia University, on Thursday afternoon at four o'clock and Friday morning at ten o'clock. The purport of the lectures is to show the gradual growth of the science from its infancy to the present day. They are accompanied by lantern slides, portraits, maps, copies of early publications, and personal sketches. There is also in course of delivery before the same department a course of ten lectures on ore deposits by Professor John D. Irving, professor of economic geology, Sheffield Scientific School, Yale University, on Thursday and Saturday mornings at ten o'clock.

PROFESSOR LAWRENCE J. HENDERSON is giving at Harvard University a course of five public lectures on "Teleology and Natural Science."

DR. ARTHUR M. BANTA, of the Carnegie Station for Experimental Evolution, addressed the Sigma Xi of Indiana University on January 27, on "Sexual Forms and the Supposed Reproductive Cycle in *Cladocera*."

AT the 222d meeting of the Elisha Mitchell Scientific Society held at the University of North Carolina on February 7, the program consisted of an address on "The Lumière Process of Color Photography," by Professor E. A. Harrington.

ON February 3, Professor W. H. Bragg delivered before the Chemical Society, London, a lecture on "The Recent Work of X-rays and Crystals and Its Bearing on Chemistry."

A MONUMENT is planned in memory of Professor Angelo Celli. It will stand on the Roman Campagna, where he made his investigations of malaria.

DR. C. WILLARD HAYES, chief geologist of the United States Geological Survey from 1902 to 1911, died on February 9 at his home in Washington, D. C. Dr. Hayes left the survey in 1911 to become vice-president and general manager of the Mexican Aguila Oil Company. He was born in Granville, Ohio, in 1859, and was graduated from Oberlin College in 1883, and in 1887 became assistant geologist of the Geological Survey.

Dr. Richard Henry Whitehead, professor of anatomy and dean of the department of medicine of the University of Virginia, died at his home in Charlottesville, on February 6, after a week's illness with pneumonia. He was in his fifty-first year.

Dr. J. Wilhelm Richard Dedekind, the distinguished mathematician, died at Brunswick on February 2, aged eighty-three years.

Professor Paul Sorauer, of the University of Berlin, known for his work on plant pathology, has died at the age of seventy-seven years.

Dr. Alzheimer, professor of psychiatry at Breslau, died on December 19, aged fifty-two years.

Professor Gross, editor of the *Archiv für Kriminal-Anthropologie,* has died in Graz at the age of sixty-seven years.

Dr. Rodolphe Engel, former professor of chemistry at the Montpellier School of Medicine, has died at the age of sixty-six years.

We learn from *Nature* that Dr. Reginald Koettlitz and his wife have died from dysentery at Somerset, South Africa, where Dr. Koettlitz was in practise. He joined the Jackson-Harmsworth Polar Expedition in 1894 and was senior medical officer in the late Captain Scott's expedition of 1902. In these expeditions and in South America and Africa he had carried on important work of exploration.

William Inchley, lecturer in mechanical and electrical engineering at University College, Nottingham, author of valuable publications on mechanics and heat engineering, was killed on December 19 at the age of thirty-two years, while serving as second lieutenant in the British army.

The *Journal* of the American Medical Association records the following deaths: Tiburcio Padilla, one of the leaders of the profession in Argentina, ex-governor of his province, Tucuman, aged eighty; F. L. von Neugebauer, of Warsaw, noted for his numerous articles on gynecologic subjects but especially for his study and publications on hermaphroditism and allied conditions; L. R. Lorentzen, of Copenhagen, president for a number of terms of the Danish Medical Association, aged sixty-three; M. De Cristoforis, to whose efforts is due in large part the leading place taken by Milan in public hygiene, aged eighty; T. Langhans, until recently professor of pathologic anatomy at the University of Bern, aged seventy-six; A. Mendonça, chief of the bacteriologic institute connected with the medical school at S. Paulo, Brazil, and founder of the *Revista Medica de S. Paulo.*

The University of California has announced a series of Saturday morning lectures, open to the general public on the problems of tropical medicine, a field of work to which particular attention is being paid by members of the staff of the Hooper Foundation for Medical Research of the University of California. These lectures, at the University of California Hospital in San Francisco, are as follows:

January 15—Dr. E. L. Walker, "The Scope of the Literature on Tropical Medicine."

January 22—Professor Walker, "Entamoebiasis," with a clinical discussion by Dr. H. C. Moffitt.

January 29—Professor Walker, "Leishmanioses," with a demonstration of cultures and living organisms.

February 5—Dr. K. F. Meyer, "Trypanosomiases," with a demonstration of living organisms.

February 12—Professor Walker, "Malaria in California," with a demonstration of material.

February 19—Dr. H. C. Moffitt, "Clinical Aspects of Malaria in California."

February 26—Dr. K. F. Meyer, "Piroplasmiases," with demonstrations.

March 4—Dr. H. F. Nichols, "Spirochetiases."

March 11—Dr. Billings, "The More Important Helminthiases."

March 18—Dr. K. F. Meyer, "Yellow Fever, Dengue and Pappataci."

March 25—Dr. K. F. Meyer, "Typhus, Spotted Fever and Verruga Peruviana."

April 1—Dr. Howard Morrow, "Leprosy and Tropical Skin Diseases."

April 8—Dr. Billings, "Beriberi and Pellagra," with demonstrations.

April 15—Dr. E. L. Walker, "Parasitic Insects and the Rôle of Insects in the Transmission of Tropical Diseases."

April 22—Dr. K. F. Meyer, "Tropical Hygiene and Sanitation—Summary of the Present-day Achievements."

PROFESSOR GROSS, editor of the *Archiv fur Kriminal-Anthropologie und Kriminalistik,* has died in Graz at the age of sixty-seven years.

Nature quotes from the *Journal* of the Institution of Electrical Engineers for December 15, 1915, a report of a presentation of original Faraday papers made to the institution by Mr. D. J. Blaikley, whose wife is a niece of Faraday's. Her sister, Miss Jane Barnard, lived for several years with Faraday and his wife as a daughter of the house. She died in 1911, and left these books and papers to Mr. Blaikley to dispose of under certain conditions. They include Faraday's journal of the continental voyage which he undertook, at the age of twenty-two, as an assistant to Sir Humphry Davy—the voyage which, Professor Silvanus Thompson said, in proposing the vote of thanks to Mr. Blaikley, "transformed Faraday from being little more than a bookbinder's apprentice and laboratory assistant of a great chemist, into a man who could speak and think and work scientifically."

A COURSE of twelve lectures by the members of the New York State Museum staff is being given in the Education Building, Albany, as follows:

February 4. "The State Museum: How to Use It." John M. Clarke.

February 11. "Diamonds." H. P. Whitlock.

February 18. "The Forests of New York State." Homer D. House.

February 25. "Lake Albany—Our Present Abode." David H. Newland.

March 3. "Man and Insects." E. P. Felt.

March 10. "How Minerals are Formed." H. P. Whitlock.

March 17. "Mastodons and Elephants of New York." Rudolf Ruedemann.

March 24. "The Empire State of Indian Days." Arthur C. Parker.

March 31. "Harmonics and Cross Purposes in the Insect World." F. T. Hartman.

April 7. "Earthquakes of New York." David H. Newland.

April 14. "Nature Monuments." John M. Clarke.

April 21. "Life of the Ancient Seas." Rudolf Ruedemann.

AT the Chemists' Club, New York City, on February 11, a symposium on "Electrochemical War Supplies" was arranged by the New York Section of the American Electrochemical Society jointly with the New York Sections of the American Chemical Society and the Society of Chemical Industry. Chlorine, hydrogen and many other electrochemical products which were a drug on the market before the war have become valuable. New electrochemical industries like that of metallic magnesium have been started. This whole electrochemical development is of the utmost importance to every chemist and engineer, and to the American nation at large. The speakers were: Lawrence Addicks, "Electrochemical War Supplies"; W. S. Landis, "Air Saltpeter"; E. D. Ardrey (U. S. Navy), "Hydrogen for Military Purposes"; Albert H. Hooker, "New War Products"; William M. Grosvenor, "Magnesium"; G. Ornstein, "Liquid Chlorine"; Geo. W. Sargent, "Electric Steel"; W. R. Ingalls, "Electrolytic Zinc." Dr. L. H. Baekeland, Dr. J. W. Richards, Mr. W. L. Saunders, Mr. E. A. Sperry, Mr. B. B. Thayer, and other engineers consented to be present and express their views.

THE Society of American Foresters, at its annual meeting, held in Washington, on January 22, adopted a resolution endorsing the present federal migratory bird laws.

THE *Journal* of the American Medical Association states that the demonstration train of the State Board of Health started on its initial trip, January 10. The train consists of three Pullman cars, the first of which is used as an office with sleeping and dining accommodation for the demonstrators. The second contains the dynamo, sleeping quarters for the train crew, and various models such as the illustration of the Imhoff tank sewage disposal system; contamination of water in driven or open wells from polluted or service water; a modern dairy; proper feeding and clothing of babies; open-air treatment of tuberculosis and other similar questions of public health. In the third car are displayed thirty-six panel posters

giving warnings and advice on sanitary subjects and disease prevention and a large stereomotograph. On the initial trip the train was in charge of Dr. Joseph Y. Porter, state health commissioner, and Miss F. D. Herndone, his assistant. Surgeon Carroll Fox, U. S. P. H. S., also accompanied the train to inspect health conditions in the state and to observe the workings of this plan of popular sanitary education.

In commemoration of the centennial of the independence of Argentina, 1816–1916, the Academy of Medicine offers a prize of 2,500 pesos for the best unpublished work on a medical subject presented at the Congress of Social Sciences to be held at Tocyman, Argentina, July 9, 1916.

A Vienna manufacturer has given $100,000 to found an institution to study the technical side of nutrition for the people, by correlating the findings of organic chemistry, biology, physiology, etc. It is to be called the Institut für Volksernährung.

The *Journal* of the American Medical Association states that the minister of justice has appointed a commissioner to study crime in Chile and to report to the government his recommendations for measures to prevent crime, reform delinquents, and for the classification and separation of prisoners. A laboratory of experimental psychology is to be established in the penitentiary at Santiago, and physicians in penal institutions will be required to furnish information or data in connection with the work.

For some years the formation of a society and the publication of a journal devoted to applied optics has been under consideration by a number of persons. In November, 1915, such a society, called the Association for the Advancement of Applied Optics, was formed in Rochester. This was so constituted that it might become a local section of a larger society when such should be organized. The officers of the Rochester society are Dr. P. G. Nutting, president; Dr. H. Kellner and Professor Howard Minchin, vice-presidents; Mr. L. A. Jones, recording secretary; Dr. F. E. Ross, corresponding secretary and Mr. Adolph Lomb, treasurer. Since its organization this society has held well-attended, regular meetings every two weeks. The initial organization has shown such strength that it has been decided to proceed at once with the organization of the larger society so that the journal may be started with the next calendar year. A committee on organization is being selected and later, officers and editors will be chosen by ballot. The president and corresponding secretary of the local society will serve as temporary chairman and secretary of the organizing committee. Both may be addressed at the Research Laboratory, Kodak Park, Rochester. A tentative draft of the proposed constitution and by-laws will be submitted shortly for approval.

Nature states that the *Scotia,* which was the vessel that carried the Scottish National Antarctic Expedition to the south polar regions, under the command of Dr. W. S. Bruce, has been burnt in the Bristol Channel, and has been run ashore at Sully. It was hoped at the end of the expedition that the *Scotia* might be further endowed and handed over to the universities of Scotland as a well-fitted oceanographical ship, but this was not to be, and she fell to the hammer as a whaler. Later, however, she was chartered by the Board of Trade as the most suitable vessel on which to carry out ice observation, meteorology and oceanography in the North Atlantic Ocean after the wreck of the *Titanic.*

The Broad Pass region of Alaska, which has long been considered a possible source of mineral wealth, has taken on additional interest since the announcement of the route chosen for the new government railroad connecting the Pacific coast with the interior of Alaska. In anticipation of the probable demand for information about this region the United States Geological Survey began the work of mapping its topography and geology in 1913, and now presents the results of the work in Bulletin 608, by F. H. Moffit, "The Broad Pass Region, Alaska." Broad Pass is the western part of a wide glacial valley which is bordered by steep, straight mountain walls and which lies parallel with a great east-west

range on the north and connects the upper valleys of Chulitna and Susitna rivers. Nenana River, a tributary of the Tanana, occupies the eastern part of the region. The valley of Jack River, which crosses Broad Pass just above the narrow valley of the Nenana, before that stream passes through the Alaska range, provides the route by which the railroad will cross from the Susitna-Chulitna drainage basin to that of the Tanana. The upper parts of streams tributary to Chulitna and Jack rivers overlap each other within Broad Pass, there being no appreciable divide between, so that the grades from the head of the Chulitna to the head of the Susitna are gentle and there is no obstruction. North and south of Broad Pass are high mountains. Those on the north are part of the great range from which, only 70 miles to the west, rise Mount McKinley and, nearby on the east, Cathedral Mountain and Mount Hayes. There is a fair growth of timber in the larger valleys but most of the country is above timber line. This region has long been a favorite hunting ground for the Indians of the Susitna valley. The geologic conditions in the region appear to be favorable to mineralization, but no valuable ore bodies have yet been discovered. The most favorable reports come from the district just west of Broad Pass, near the head of Chulitna River, an important gold placer district, where prospecting has been carried on for several years. Valdez Creek lies about thirty miles east of the pass. Along some of the streams between Broad Pass and Valdez Creek there are prospects of placer gold, which, however, has not been found in commercial quantity. Copper prospects, too, have been discovered in several parts of the region, and at one place, Coal Creek, there is a small area of coal. The railroad, which will probably soon reach this region, will aid greatly in its development. The wealth of the Broad Pass region appears to be mineral rather than agricultural, and it can be profitably exploited only by a greater population and through better means of transportation.

AT the meeting of the Royal Society on November 11 Sir Ronald Ross read an introductory paper on "Pathometry." According to an abstract the method he proposed to follow in studying the nature of the functions according to which the number of individuals infected with some disease should vary from time to time, on the supposition that the laws governing the rate of transference of the considered disease were already known *a priori*. He stated the fundamental problem under consideration in the following terms: "If a population is divided into two groups, namely, those who are affected by some kind of happening, such as an infectious disease, and those who are not so affected; and if in unit of time a constant or variable proportion of the non-affected become affected, while simultaneously a constant proportion of the affected become non-affected (that is, revert or recover); and if at the same time both the affected and the non-affected are subject to different birth-rates, death-rates and rates of immigration and of emigration, so that the whole population may be incessantly varying during the period under consideration; then what will be the number of affected individuals and also the number of new cases at any moment during that period?" In this first paper the problem was presented in mathematical language, with its solution, and a broad analysis of the curves obtained and of some integrals. Only constant rates of happening (applicable to other happenings besides disease), and rates which varied according to the number of individuals already affected (specially applicable to infectious diseases) were considered. In the latter cases the resulting curves were frequently bell-shaped, declining a little more slowly than they rose—that is, generally similar to the curves frequently seen in epidemics—thus suggesting *prima facie* that epidemics might be largely explicable in the terms of the thesis given.

UNIVERSITY AND EDUCATIONAL NEWS

THE General Education Board announces appropriations to colleges as follows: Maryville College, Maryville, Tennessee, $75,000 toward an endowment fund of $300,000; West-

ern College for Women, Oxford, $100,000 toward an endowment fund of $500,000; Milwaukee-Downer College for Women, Milwaukee, Wisconsin, $100,000 toward an endowment fund of $500,000. Including the foregoing, the General Education Board has since its organization thirteen years ago appropriated to colleges $12,322,460 toward a total sum of $57,375,525 to be raised.

The board of trustees of the Carnegie Institute, Pittsburgh, announce the gift of $250,000 from the Carnegie corporation of New York, the money to be used for the purchase of ground north of the present campus.

The formal opening of Alden Hall of Biology of Allegheny College took place on February 4. Dr. W. J. Holland, director of the Carnegie Museum of Pittsburgh, gave the principal address on "Biology, a Cultural and Practical Study." The building is 60 feet by 120 feet, built of gray vitrified brick and terra cotta, with a Spanish tile roof, and is well equipped throughout. Professor C. A. Darling is in charge of the department.

It is stated in *Nature* that the number of undergraduates in residence at Cambridge this term is 665, as against 1,227 during the corresponding term last year, and about 3,600 in a normal term. Amongst the 11,000 members of the university in the land, sea and air services, 1,723 casualties have been notified; 697 have been killed and 892 wounded.

The Berlin correspondent of the *Journal* of the American Medical Association writes that during the semester preceding the opening of the war, 79,077 students (of whom 4,500 were women and about 9,000 foreigners) attended the fifty-two universities and other higher institutions of the German Empire. Of this number 60,943 (4,117 women, 4,100 foreigners) were enrolled in the twenty-one universities; 12,232 (82 women, 2,500 foreigners) were enrolled in the eleven technical schools. The six schools of commerce (Berlin, Cologne, Frankfort, Leipzig, Mannheim and Munich) had 2,625 students, and the four veterinary colleges (Berlin, Dresden, Hanover and Munich) had 1,404 students. The three argicultural colleges had 938 students. Three schools of mining had 668 students, and 267 students were registered in the four schools of forestry. During the first semester following the beginning of the war, the total number of matriculants fell to 64,700 in forty-seven of these institutions. The four schools of forestry were closed, and the veterinary school in Munich became a part of the university. During the winter of 1914–15, about 50,000 of these students were in the field or available for service; that is, 75.75 per cent. of the 66,000 German male students registered at the beginning of the war. Of the 66,000 German male students who were registered at the end of the summer of 1915, only 12,000 are still in attendance at the schools so that about 54,000, or 81.81 per cent., of German higher students are now enrolled in the army. Of the 13,785 university students registered during the summer semester of 1870, only 4,400 (32 per cent.) were at the front, and 3,200 of this number fell in the field.

Dr. Howard E. Pulling has been appointed to an instructorship in plant physiology in the Johns Hopkins University for the current year.

Dr. Robert Lewis, assistant biochemist at the United States Pellagra Hospital, Spartanburg, S. C., has been elected professor of physiology in the University of Colorado.

DISCUSSION AND CORRESPONDENCE

ATMOSPHERIC TRANSMISSION

To the Editor of Science: In Science for December 3, 1915, page 802, line 27, Mr. Very speaks as positively as ever of the diurnal variability of the transmission of the atmosphere and the incorrectness of neglecting its effect in reducing solar constant observations. Does the evidence to the contrary of the observations of September 20 and September 21, 1914, when the sun was observed at Mount Wilson from sun-rise to 10 o'clock, weigh nothing at all with him?[1]

Secondly. In his recent paper on "Earth-

[1] See "New Evidence on the Intensity of Solar Radiation Outside the Atmosphere," by Abbot, Fowle and Aldrich, Smithsonian Miscellaneous Collections, Volume 65, No. 4, 1915.

shine"[2] Mr. Very hangs the merit of his work on the exceptional clearness of August 8 and 9, 1912. It is very singular that these exceptionally clear days occurred when the effects of the dust cloud from Katmai volcano were at their maximum. At various high altitude stations the direct sunlight at high sun was reported to be reduced in August from 10 to 20 per cent., and skylight near the sun in daytime notably increased, yet it is at this very time that the moonlight scattered by the sky near the moon was so exceptionally small at Flagstaff.[3]

Thirdly. Mr. Very, in his paper submitted at Berkeley,[4] argues a high transparency of the atmosphere for the escape of terrestrial radiation, as opposed to the conclusion of Mr. A. Ångström. Very states "that practically all the terrestrial radiation which the atmosphere is capable of absorbing disappears in the first few meters of air traversed by the rays" and hence "the observed nocturnal radiation is a radiation to space," contrary to the opinion of Mr. A. Ångström that only a fraction of it is a radiation to space.

The phenomenon is as follows: A blackened surface at 20° C. is found to give off radiation at a rate of from 0.12 to 0.20 calories per square centimeter per minute when exposed to cloudless night sky. Such a surface would radiate about 0.55 calories if exposed to an enclosure at absolute zero. The question is: Does the nocturnal radiation observed (0.12 to 0.20 calories) represent radiation transmitted almost wholly to space, or is it in a large degree representing merely the radiation of the surface outward minus the radiation of the atmosphere inward? Mr. Very claims that for wave-lengths at which the atmosphere can absorb the rays, its full absorptive effect is produced within a few meters of the radiating surface. Here the temperature is not materially different from that of the surface, and re-radiation of the atmosphere in these wave-lengths approximates that of the black surface according to his view. Mr. Ångström, on the other hand, believes that many of the absorbable rays penetrate far into the atmosphere, where the temperature becomes much reduced, and hence the re-radiation is less than the outgoing radiation because it comes from a source at lower average temperature.

The point at issue is solved if it can be shown that increased length of path, or increased atmospheric humidity, do or do not affect nocturnal radiation. For the evidence see Table IX., p. 63, of A. Ångström's paper, "A Study of the Radiation of the Atmosphere," Smithsonian Miscellaneous Collections, Vol. 65, No. 3. Experiments were made at two stations on the radiation to small parts of the sky at different zenith distances. I refer particularly to observations at Bassour, Algeria, although Mt. Whitney observations support the following conclusions too. Length of path in the atmosphere is shown to be of decided effect. The change from air mass 1 to air mass 3 reduced nocturnal radiation on August 20, 1912, by more than 70 per cent. The result also depends on the degree of humidity prevailing, as is shown plainly by inspection of the whole table. These results show that the whole vertical thickness of the atmosphere is insufficent to absorb "practically all the terrestrial radiation which the atmosphere is capable of absorbing."

C. G. ABBOT

[2] See *Astronomische Nachrichten*, Nos. 4,819–20, 1915.

[3] See in this connection Kimball, "The Effect Upon Atmospheric Transparency of the Eruption of Katmai Volcano," *Monthly Weather Review*, 1913, 41: 153–159, also, "Volcanoes and Climate," by Abbot and Fowle, Smithsonian Miscellaneous Collections, Volume 60, No. 29, 1913; also Kimball, *Monthly Weather Review*, September, 1915, p. 442, in which he shows for Santa Fé, New Mexico, elevation 7,000 feet, that as late as the last half of October, 1912, the mean solar radiation was only 1.37 calories at $z = 48°$, whereas he obtained 1.53 calories as the mean for the corresponding period of 1914.

[4] See *Pop. Ast.*, Vol. 23, p. 648.

UNIVERSITIES AND UNPREPAREDNESS

TO THE EDITOR OF SCIENCE: Some weeks ago an open letter from Professor Stewart Paton appeared in SCIENCE. It was entitled, "Universities and Unpreparedness." It suggested that universities could play an important part

in the solution of the problems raised by the war. It intimated that an increased amount of faculty, in contrast to trustee, government over our universities would contribute to this end. It requested that others who might have ideas on this subject should publish them.

Three points occur to me.

1. If the members of our university and collegiate faculties are given such a part in the direction of the policy of their institutions as Professor Paton suggests, and as Professor J. McKeen Cattell has contended for, they will undoubtedly be much happier and better satisfied with their station in life. With Professor Paton and Professor Cattell this appears to be a theory. For a Yale professor it is not a theory but a fact. For here at Yale professors have, in as full a measure as one could possibly ask the trustees to concede, the power of shaping educational policy and choosing colleagues. As a result we are an unusually contented lot of men. Perhaps we are too contented.

2. Professor Paton is in error I think in believing that this mode of university government makes for progressivism in education. The more people there are who have to be convinced of the wisdom of a new measure, the longer it takes to get the measure adopted. Yale under faculty government is not celebrated for radicalism. The great advances in which Harvard led were effected largely because of the aggressive spirit of President Eliot in support of new ideas. Experience demonstrates that presidents and deans are comparatively easily won over to changes of educational policy and methods. Boards of full professors are far less readily convinced, while general faculties including assistant professors and instructors are usually overwhelmingly dominated by stand-pattism.

3. The principal obstacle to the introduction of the idea of service into the work of our universities is the American college. On the whole our colleges are stronger in funds and prestige than all our professional schools and the other departments of our universities put together. The ideal of the colleges is almost universally that of diffuse culture as opposed to special training. For social reasons their students enter two years older than they should. For no reason that can be justified in utility they are kept for four years. Against every dictate of reason and service they usually work, even under the elective system, in a sort of lock-step which sets the pace for the most earnest by the average or even the indolent.

To develop American education so that it will turn out our young men prepared to be of service in the various highly specialized fields of modern life, the first essentials are to reduce the importance of collegiate education, to give the B.A. degree after two years of work, and to have accepted as part of this work whatever the professional schools want as preliminary training.

I doubt whether there is a sufficiently general comprehension in college faculties of the enormous handicaps which they now place upon professional education to bring about these changes within any reasonable time. Meanwhile a general introduction of arrangements between professional schools and colleges such as those involved in the six-year combined course for the B.A. and M.D. degrees, and similar arrangements for law and engineering, should be encouraged in every possible way.

It is only by the introduction of the vocational motive that collegiate instruction can be made serious, and the student freed from the idea that, as it doesn't matter what he studies in college, it makes no difference whether or not he studies at all.

For those who have no vocational object it might be well to institute a course coordinate with the professional schools, and leading to the degree of C.G.L. or Cultivated Gentleman of Leisure. The materials for it could easily be culled from the present list of academical studies. It would afford the needful university registration for the devotees of athletics, secret societies and other extra-curriculum activities.

Yandell Henderson

Yale Medical School,
New Haven, Conn.,
January 30, 1916

QUOTATIONS

THE ORGANIZATION OF SCIENCE

I WONDER whether other readers of *Nature* besides myself caught the interference fringes from three facets of this glittering subject in the issue of December 2? The first was the Royal Society's advertisement for applications for grants for scientific investigations from the government fund; the second, the editorial contrast between the rates of pay for legal and for scientific services; and the third, the anniversary address of the president of the Royal Society, containing the suggestion that science does not take its place in the national organization because the general public looks upon scientific investigations as a hobby.

What else can the general public do while men of science, in dealing with one another, generally act upon the principle that scientific investigation is a hobby for which facilities are required, not payment? The demonstration afforded by the Government Grant Committee and the Committee of Recommendations of the British Association is conclusive. The normal practise is for these committees to be asked to supply a portion—rarely the whole—of the expenses of some scientific investigation. The applicants in reply to the advertisement will think it meritorious to offer their brains and the time required to use them without asking for any payment. That is the true criterion of a hobby. So great is the power of science to transform serious occupations into hobbies that even lawyers sometimes find themselves astride and ambling with the rest.

In justification of the scientific societies, it may fairly be said that they were intended for the riding of hobbies, and everything in their constitution and practise conforms with that eminently useful ideal. Scientific societies rely very largely upon unpaid work, and long may they continue to do so. One of their chief attractions is that within their precincts there is a respite from the wearing obligations of debit and credit. One can not find the like about a law court or a house of business, where as a rule those who are paid most are treated with the highest respect.

It is the difference between hobby and business that brings us to the parting of the ways. If the national scientific effort is organized through the agency of societies where all the best work, even by the officers, is done without any regard to payment, we can not expect the public to look upon science as a business into which pecuniary considerations enter. It is, and must remain, a hobby. If, on the other hand, there should be created a Privy Council for Science, as Sir William Crookes suggests, there would be at least a permanent staff to whom the idea of paying for brains and time would not be fundamentally repugnant as it must be to the officers of a society.

The idea of scientific investigation as a hobby does not necessarily originate with the general public; it is indigenous in the older universities, where there are a large number of college officials intellectually competent to undertake researches, some of whom do and some do not. At Cambridge in my time scientific investigation was the occupation of the leisure of men whose maintenance was provided by the fees and emoluments of teaching. It was as much a hobby as chess or photography. There was no sense of collective responsibility for providing the nation with answers to its scientific questions. Scientific researches had become an element of competition for rewards of various kinds, and some "research students" were paid; but the idea of "making a living" by scientific investigation never reached the surface, though the merit acquired by research might weigh in the appointment to a post for teaching or administration. On the contrary, the early agitation for the endowment of research was regarded as finally disposed of by calling it the research of endowment, as though the wish to be paid were conclusive evidence of insincerity.

The suggested council will have some difficulty in organizing adequately paid research. The endowed researcher in the national interest must expect an occasional audit of an imperious character, and his employers must see their way to act upon it. With teaching the difficulty is less. If the students of one year do not respond, the next year may be more successful. It takes just about a lifetime to

satisfy ourselves about our own weaknesses. The responsibility is nicely divided; it is just as much the duty of the students to learn as of the lecturer to teach, and neither student nor teacher has the material for a considered judgment upon the matter. That is why the "hobby" system, with occasional rewards for exceptional success, is so popular. It can be worked best by letting things go their own way.

The present state of things, which all agree in deploring, can be altered by drawing a clear distinction between a society's hobbies and the nation's purposes, and entrusting them to separate administrative management. Mr. Carnegie has made it clear that the financial detachment of a voluntary society is not essential to the successful organization of scientific research.—F. R. S. in *Nature*.

SCIENTIFIC BOOKS

Studies in Edrioasteroidea. I.–IX. By F. A. Bather. Published by author at "Tabo," Marryat Road, Wimbledon, England, October, 1915. Pp. 136, 13 plates. Price 10s.

This book by the well-known authority on echinoderms contains a series of articles that were published from 1898 to date in the *Geological Magazine,* but of which no separata were distributed because the plates were lost while in store. In consequence of this unfortunate circumstance several authors, the present writer among them, have become guilty of ignoring important results of Dr. Bather's studies.

The earlier papers contain elaborate descriptions of all known Edrioasteroidea based on so careful preparation of specimens that months were spent in several cases in cleaning a single specimen. By this method the finest details, notably in our North American *Edrioaster bigsbyi,* were brought out, such as the hydropore and the small plates of the periproct. Three new genera are distinguished, but most important are the three concluding articles, published in 1915, which contain the morphology and bionomics of the Edrioasteroidea, a comparison of their structure with that of the Asterozoa, and a discussion of the genetic relations to other Echinoderms. In these chapters Dr. Bather not only succeeds in demonstrating much closer resemblances between these early pelmatozoans and the Asteroidea than were hitherto suspected, but also in tracing the probable course of derivation of the Asteroids from the Edrioasteroidea. These conclusions give the work a distinctive value for all students of phylogeny.

The book is finely illustrated with diagrams and a dozen plates of good photographs and very lucid drawings. Rudolf Ruedemann

New York State Museum

SPECIAL ARTICLES

ADAPTABILITY OF A SEA GRASS

While dredging during July, 1915, in the Gulf of Mexico near the Dry Tortugas on the Carnegie Institution's yacht, *Anton Dohrn,* the writer's attention was attracted to two comparatively rare plants. These plants, which are species found only in the western hemisphere, were remarkable not only for their curious and interesting morphology, but rather for the unusual conditions under which they were found growing. Although spermatophytes, these plants came up in the dredges with marine algæ from a depth of sixteen to eighteen fathoms, *i. e.,* ninety-six to a hundred and eight feet. The algæ associated with them were the usual species found in those waters, viz., *Caulerpa, Halimeda, Penicillus, Codium, Udotea, Acetabularia,* etc. Bottom samples taken with a clasper on the sounding instrument showed the Gulf floor here to consist of a fine white mud composed of calcareous débris such as broken corals, molluscan shells and echinoderm tests.

All the plants were carefully picked out of the miscellaneous material which came up in the dredges and preserved. These on being later brought north were identified by the writer as two species of *Halophila* du Petit Thouars, and the only members of the genus, as remarked above, to be found in North or South America, and belonging in the order Hydrocharitales. A brief description of these two species is given as they have a limited range in the tropical waters of the western

hemisphere; the smaller particularly has been collected at only a few stations in the West Indies.

The larger and more widely distributed is *Halophila Engelmanii* Aschers. It is a delicate plant creeping over the muddy bottom and rooting at the nodes by white fibrous roots. The leaves are very short petioled, serrate and produced in whorls or clusters, so accurately described by Bailey Balfour[1] for *H. stipulacea* (Forsk.) Aschers., which he found on the island of Rodriguez in 1874. The plants are dicœcious with axillary inflorescence. Small,[2] who has collected the species in the Florida Key region, says the flowers and fruit have not been seen; however, the author collected pistillate flowers and ripe fruits in abundance in all the dredges in which the plant came up. The flowers are invested in a bibracteate axillary spathe on a short pedicel. The original description of the species by Ascherson[3] is rather vague as to the flowers since he classified the species largely by the leaves and Bentham and Hooker[4] give the species a casual and somewhat doubtful treatment. A great many of the older writers on the genus in describing the flowers of *Halophila* mistook the pistil with the hypanthium to be all pistil, and what are the true styles to be long stigmas, thus completely overlooking the perianth. The pistillate flower really consists of a small flask-shaped ovary, sessile in the spathe formed by the two bracts and prolonged into an elongated hypanthium, 3 mm. in length, on top of which is the three-parted perianth. This species, although it has not been figured in any works so far as the writer's knowledge goes, does not differ materially from *H. stipulacea* (Forsk.) Aschers., found in the Indian Ocean and described with such elaborate and careful drawings by Balfour,[5] except that the stipular bracts at the nodes are lacking.

H. Baillonis Aschers., the other and smaller species found in the dredging operations, is the only one in the genus that is monecious. Early writers suspected the monecism of this species, but Holm's[6] work on the species confirmed the suspicion. Holm's work also has been very careful and accurate, but his plates do not show the peculiar arrangement of the staminate and pistillate flowers lying in such close proximity in the spathe as to suggest self-fertilization. Close pollination, however, does not seem to be of general occurrence in the genus. In appearance *H. Baillonis* Aschers. resembles very much *H. ovalis* (R. Br.) J. D. Hook, which is the most widely distributed species in the genus occurring throughout the Indian Ocean and South Sea, except that *H. Baillonis* is monecious and has serrated leaves.

The fertilization of *Halophila* has never been actually seen, but the researches of both Balfour and Holm on the morphology of the anther and pollen have led to the supposition that the manner of fertilization is similar to that of *Zostera marina* as observed by Clavaud[7] and Engler[8] except that in the latter plant the pollen grains individually are elongated cylindrical bodies, while the pollen of *Halophila* occurs in the anther sacs in coiled, spiral chains, the pollen grains adhering to each other by a mucilaginous substance. These chains are carried from the proterandrous staminate flowers to the long filiform styles of the pistillate flowers in other spathes by the water current, the chains getting entangled on these styles and fertilizing the ovules.

However interesting the structure of these lowly submerged plants may be, the peculiar conditions under which they were found grow-

[1] Balfour, B., "On the Genus *Halophila*," *Trans. Bot. Soc.*, Edinburgh, XII., pp. 290–334, 1879.

[2] Small, J. K., "Flora of the Florida Keys," New York, 1913, p. 5.

[3] Ascherson, P., "Neumayer Anleit. zu Wissen. *Beobacht. auf Reisen*," 1857, p. 368.

[4] Bentham & Hooker, "Genera Plantarum," f. III., p. 435.

[5] Balfour, *loc. cit.*

[6] Holm, Th., "Recherches anatomiques et morphologiques sur deux Monocotyledones Submergeés," *Bihang. till. K. Svenska. Vet.- Akad. Handlingar*, Bd. 9, No. 13, 1885.

[7] Clavaud, Armand, "Sur le veritable mode de Fecondation du Zostera marina," *Ann. Soc. Linn. Bordeaux*, p. 109, 1878.

[8] Engler, A., *Botan. Zeit.*, p. 654, 1879.

ing give them still further interest and help to confirm an idea recently expressed by T. W. Vaughan[9] in his geologic research on the origin of the islands in the waters in which these species of *Halophila* grow, viz., that South Florida and the adjacent Keys have undergone a recent depression. The material of which these islands is formed was deposited in Pliocene times, this material being contributed by various agencies, coral reefs and calcareous mud precipitated by denitrifying bacteria, etc. The land thus formed suffered a series of oscillations which Vaughan tabulates and which the writer here reproduces from Dr. Vaughan's paper.

Oscillations of South Florida

Recent—	Uplift. Depression (modern reefs).
Pleistocene—	Depression (Pleistocene reefs, part of which stood as much as 18 feet above sea level). Uplift.
Pliocene—	Depression (some coral reefs but no well-developed reefs).

Vaughan says in part concerning these movements:

> Pliocene deposition was followed by uplift which was succeeded by depression during the Pleistocene subsidence along a curve from the eastern side of Biscayne Bay, first trending south and then bending west, a barrier coral reef flourished, separated by a channel from the main bank on which the Miami oolite was forming or had formed in strongly agitated waters. West of the coral reef, on an extensive flat in shoal water, the Key West oolite was formed, while still further to the westward the Tortugas were outlined under the influence of water and currents.
>
> This period of events was succeeded by the elevation of the entire key region to more than fifty feet above its previous level. This uplift was succeeded by a depression, lowering the surface thirty feet or more, establishing the same relation of the sea level to the land that now prevails. Subsequent to the beginning of the last depression the present barrier reef has developed seaward of the keys on a platform already prepared for it, the Marquesas have been formed by winds and currents and coral reefs have reestablished themselves in the Tortugas.

From this it is seen that the land in the region in which these two species of *Halophila* have been collected has in Recent times undergone a considerable depression. The writer therefore assumes that these plants grew, in earlier times, in much shallower water and in depths at which they are more generally found to-day. Small[10] mentions the genus as occurring in "shallow water," Balfour collected *H. ovalis* on Rodriguez on the reefs surrounding the island "on shoals just uncovered at low water" and *H. stipulacea* in "slightly deeper places where it is submerged." Baron d'Eggers,[11] who collected *H. Baillonis* Aschers. in Saint Thomas harbor, says:

> The plant grows in coarse sand at a depth of two to four fathoms, here and there.

The habitat of *H. Beccarii* Aschers., too, has been well described by Beccari[12] himself in his book, where he says:

> Toward dusk on the bank of the Bintulu I caught some curious crustaceans and a small water snake. It was only after I had been wading about for some time that I discovered that the soft substance under my feet was not mud but a sheet of vegetation composed of a minute submerged plant hidden by a thin layer of fine slush so that it was not easily distinguished at first. I afterward found that in some places it was uncovered and quite exposed.

From these references it is seen that the genus is usually found in comparatively shallow water. The sea grasses in general, according to Ascherson,[13] are found in depths not over ten meters but Lorenz[14] reports *Posidonia Oceanica* (L.) Del. as occurring in the Gulf of Quarnero at a depth of eighteen to thirty-

[9] Vaughan, Thomas Wayland, U. S. Geological Survey, "Building of the Marquesas and Tortugas Atolls and A Sketch of the Florida Reef Tract," Pub. No. 183, Carnegie Inst. of Wash., D. C., 1914.

[10] Small, J. K., *loc. cit.*

[11] d'Eggers, Baron, "Flora of St. Croix and the Virgin Islands," *Smithson. Inst. Bull. Nat. Mus.*, No. 13, p. 98, Wash., D. C., 1879.

[12] Beccari, Odoardo, "Wanderings in the Great Forests of Borneo," London, p. 262.

[13] Ascherson, P., *loc. cit.*

[14] Lorenz, Th., "Physik. Verhältnisse und Verteilung der Organismen im Quarn Golfe," p. 249, Wien, 1863.

five fathoms, that is, thirty to fifty meters; however, Ascherson regards this as the extreme limit for plants of this type and possibly this depth has never been reported elsewhere.

That the two species of *Halophila* described above may have been growing in these Florida waters in Pleistocene times or even an ancestral type of *Halophila* we can have no means of ascertaining, but taking into consideration the clarity of the water at present and the ease with which light can penetrate it, it is not unreasonable to suppose that enough light can be secured by the assimilative tissues of the plants for photosynthetic activities at great depths. Now even though the plants experience some difficulty in their synthesis due to a lessened intensity of light, a change so gradual as the depression of a great area of sea bottom would seem to give a plant belonging to so plastic a group as the Hydrocharitales an ideal opportunity to react to the changing environment.

To summarize briefly, then, the occurrence of these two species of *Halophila* at an unusual depth, probably illustrates the adaptability of the genus and supplements the geological evidences for a depression of the Florida key region. In conclusion the writer wishes to express his gratitude to Professor Van Ingen, of Princeton, for suggesting that these observations might be of general interest.

HOWARD H. M. BOWMAN
UNIVERSITY OF PENNSYLVANIA

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE SPECIAL MEETING[1]

IT will be remembered that the Council of the American Association for the Advancement of Science at its Columbus, Ohio, meetings held from December 27, 1915, to January 1, 1916, voted to permit the association to hold a special meeting on January 3 and 4, 1916, in Washington as an indication of the interest of the association in the meetings of the Second Pan-American Scientific Congress which were held in Washington from December 27, 1915, to January 8, 1916.

[1] Held on January 3 and 4, 1916, in cooperation with the Second Pan-American Scientific Congress.

The opening meeting was held on Monday night, January 3, in the Memorial Continental Hall and was largely attended by members of the association and by delegates to the Pan-American Congress.

Dr. R. S. Woodward, past-president of the American Association, presided and introduced Mr. John Barrett, director general of the Bureau of American Republics and secretary general of the Second Pan-American Scientific Congress, who made an address of welcome as follows:

"I consider it a great honor and privilege to say a word this evening. While I may not be classed as a scientist in the same way as we would classify Dr. Campbell and Dr. Woodward, I can frankly say that I have learned more during the past ten days about the science of international congresses than I ever dreamed could be discovered in a lifetime.

"Speaking as the Secretary General of the Second Pan-American Scientific Congress, I extend to you all congratulations upon the holding of this joint session of the American Association for the Advancement of Science and the Second Pan-American Scientific Congress. I bring to you from the latter an expression of profound interest in what your organization is achieving and we feel flattered that you should have arranged this special meeting.

"It may interest you to know that this Second Pan-American Scientific Congress is the largest official international gathering which has ever assembled in the history of the national capital, and, at the same time, the largest Pan-American official gathering which has ever been called together in any capital of the Western Hemisphere. It is indeed fortunate, moreover, that it should meet at this remarkable time in the world's history, when the harmonious meetings and discussions of the representatives of the twenty-one American Republics should stand out so strongly in contrast to the divided conditions of Europe. The silver lining of the European war cloud, if its terrible blackness can have any such brightness hidden in its folds, is the development of Pan-American solidarity, Pan-American community of interest and Pan-American friendship and peace.

"It is also most appropriate that we should now have a great Pan-American scientific assembly. Last May there met in Washington a Pan-American Financial Conference that attracted the attention of the world. Through many years we have had Pan-American political and commercial con-

gresses and conferences and now we hold in Washington a Pan-American intellectual congress which, in some respects, is more important than all the others.

"Ideal Pan-Americanism can only be achieved through cooperation in science, in education and in intellectual effort as well as in finance and commerce. Particularly is this true of the relations of the United States with the Latin-American countries, where so much attention and prominence are given to science and education.

"The American Association for the Advancement of Science is as well known throughout Latin America as it is in the United States and I am gratified to see so many of the Latin-American delegates here to-night to manifest their interest in this meeting and to give a worthy hearing to Dr. W. W. Campbell, director of the Lick Observatory and president of the association. It is also a pleasure to note that you are to be briefly addressed by Dr. Ernesto Nelson, Inspector General of Education of the Argentine Republic and a member of the Argentine delegation to the Pan-American Scientific Congress. I have known him for many years and can assure you that he stands in the forefront of the educators of South America. I am always glad, moreover, to assist at any gathering presided over by my friend, Dr. Woodward, who is your past-president and also a member of the United States delegation to the Pan-American Scientific Congress."

Dr. Woodward then called upon Dr. Ernesto Nelson, director general of Secondary Industrial and Commercial Education, Buenos Aires, Argentina, and Commissioner of Education, Panama-Pacific International Exposition, who addressed the meeting on behalf of the Latin-American delegates to the Scientific Congress. Dr. Nelson's remarks were as follows:

"As a member of the Latin-American representation to the Second Pan-American Scientific Congress, I have been invited to welcome you to-night to the American Association for the Advancement of Science. My presence here, therefore, emphasizes the delightful spirit of internationalism which characterizes scientific activities where no international boundaries exist.

"In these days, when we are busy telling one another how much stranger we are to each other, how much we have neglected to buy of or sell to each other, it is only fitting that we should also meet on a field on which we can recognize one another as old acquaintances; on a field in which considerable cooperation has been taking place steadily and inconspicuously. I refer not only to the fact that science is a common good, a merchandise whose importation is subjected to no duty and is not dependent upon treaties to gain possession of markets, but to the fact that, through the efforts of agencies like the Carnegie Institution, the universities of Harvard, Leland Stanford, Michigan, Princeton, to say nothing of American museums, a successful work of scientific cooperation is helping to make Americans at large better acquainted with each other.

"The fact that we have come here to-night with our minds prepared to learn heavenly things gives me particular pleasure to recall that it was one of the most illustrious members of the American Association for the Advancement of Science, Dr. Benjamin Apthorp Gould, of Cambridge, Mass., who started in Argentina the work of cataloguing the stars of the Southern Hemisphere, a work which, since then, has enlisted American men of science to the extent that to-day the observatory of the University of Michigan and that of La Plata in Argentina are practically a single institution, carrying a perfectly coordinated work under the same head.

"I am aware that science alone does not make civilization, although it is the chief ingredient of it; but I do believe, as you all believe who are here, that science is the human activity that most surely helped in bringing about mutual understanding among different peoples. We may feel differently, we may act differently, but we must, necessarily, seek truth along the same lines and have the same attitude before scientific facts.

"Let me conclude, therefore, by hoping that, as time goes on, further and further opportunities of quiet scientific cooperation will present themselves before the learned men of the three Americas."

The main feature of the evening was the address by Dr. William Wallace Campbell, director of the Lick Observatory of the University of California and president of the American Association, on the subject of the "Evolution of the Stars." This was a beautifully illustrated address covering for the most part the Hale lectures by Dr. Campbell, given before the National Academy of Sciences and printed in *The Popular Science Monthly* for September, 1915, and *The Scientific Monthly* for October, November and December, 1915.

The meeting concluded with interchanges of courtesies between the members of the American

Association and the delegates to the Scientific Congress.

On Tuesday, January 4, 1916, two sessions of the association were held in the large lecture room of the U. S. National Museum—the first at 10 A.M. and the second at 2 P.M. President Campbell presided.

Abstracts of the papers presented are as follows:

Some Phases of the Origin and Evolution of the South American Fresh-water Fishes: CARL H. EIGENMANN.

The freshwater fish fauna of tropical America is very rich in species. It is entirely distinct from the fauna of Patagonia to the south of it and to the fauna of North America. The fishes of Patagonia have their nearest relatives in Australia and New Zealand. The tropical fauna does not extend south of the La Plata basin. In degrees of latitude it extends much further south of the equator than north of it. Northward it has filtered into western Colombia and thence through Panama into Central America, Mexico and in representatives of two genera into the southern United States and Cuba.

The tropical American fauna has its nearest relatives in Africa, while many of the elements of Africa and South America may be leftovers from faunas formerly extending over much larger portions of the globe, or may have been independently derived from the ocean. The Characidæ and the Cichlidæ seem to demand fresh waters for their migration from place to place. Inasmuch as these families are not found in Europe and evidently only intrusively in the southern United States and Mexico they seem to demand the presumption of a former land bridge or land wave connecting South America and Africa.

Aside from minor expeditions several notable expeditions collected fishes in various parts of South America during the last century. Between 1817 and 1820, Spix and Martins collected in eastern Brazil. John Natterer, between 1817 and 1835, collected in Brazil from Rio de Janeiro to Cuyaba, down the Guapore and Madeira and in the Rio Negro. In 1843, Castelnau made an extensive journey through South America. All of these expeditions were "Natural History" expeditions and devoted as much or more time to other things as they did to fishes.

In 1865, Louis Agassiz led the Thayer expedition to Brazil and devoted over a year, with numerous assistants, primarily to the collection of fishes. During the current century, Mr. John Haseman traveled more extensively than any other expeditions in Brazil, Uruguay, Argentina and Paraguay and devoted himself almost exclusively to the fishes. The present speaker collected fishes in British Guiana and Colombia while Charles Wilson collected in western Colombia, Mr. Arthur Henn in western Ecuador and Messrs. Meek and Hildebrand in Panama.

The fish fauna of tropical America consists of many intrusives from the ocean, like the stingaree, the flounders, the puffer and various sciænids. Of a few relicts, like *Osteoglossus* and *Lepidosiren*, of Cichlids, Pœcilids and an abundance of catfishes and their relatives, the Loricariidæ, and Callihethyidæ, etc., and above all, a host of Characids which have paralleled, both in habits and in form, most of the other freshwater fishes of the world.

Botanical Explorations in South America: JOSEPH NELSON ROSE.

Dr. Rose gave an account of his two exploring trips to South America, the first one being on the west coast, when Peru, Bolivia and Chile were explored, and the second one being on the east coast, in Brazil and Argentina. He called attention to the need for natural history exploration in South America and the unusual opportunities for the carrying on at the present time of this work by naturalists from the United States. He spoke of the kindly feeling shown by the South American scientists, and their willingness to assist him in his work, and of their interest in scientific work generally as carried on by the institutions of this country.

Mention was made of the interesting biological problems awaiting investigation, and of the fact that many new plants and animals are being found by collectors, and that there is great need of a restudy of the species already described.

Dr. Rose stated that North American collections, especially of plants, unfortunately contain very poor representations of South American material.

The various cactus deserts of South America were described, special attention being called to the remarkable display of epiphytic cacti which are to be found in the region of Rio de Janeiro.

The lecture was illustrated by lantern slides showing the desert and mountain types of vegetation.

The Distribution of Bird Life in Colombia: A Contribution to a Biological Survey of South America: FRANK M. CHAPMAN.

In conformance with a plan for zoological exploration designed eventually to cover all of South America, the American Museum of Natural History began, in 1910, field work in Colombia. Since that time, eight expeditions have been sent to that country and thousands of specimens of birds and mammals and pertinent information in regard to the country they inhabit have been secured. The identification of this material having now been nearly completed data are for the first time available to determine the life-zones of the Colombian Andes and the faunal areas of each zone. Four zones can be defined with surprising definiteness: A tropical, extending from sea-level to approximately 5,000 feet; a subtropical, extending from 5,000 to 9,000 feet; a temperate, extending from 9,000 to 12,500, or the upper limit of tree-growth, and an alpine or Paramo zone, extending from the timber line to the lower limit of snow, or approximately 15,000 feet.

Having determined these zones on the basis of collections and field studies, the investigator is now prepared to consider the problem of their faunal areas and of the origin of the forms occupying the zones above the basal or tropical zone. A detailed report on these and allied questions, together with an outline of the distribution in Colombia of each of the over 1,300 species and subspecies of birds secured is now approaching completion.

General Aspects of Zoological Exploration in South America: Wilfred H. Osgood.

Zoological exploration with particular reference to the higher vertebrates has to-day a greater significance than even a very few years ago. Aside from the increased importance it has owing to its reciprocal relations with advances in other sciences than zoology, it differs from earlier work in that it follows a definite plan and applies itself consistently to a particular region. Moreover, methods of preserving specimens and keeping records are such that the subsequent study of the material has infinitely greater possibilities than formerly. It is evident also that results rapidly become cumulative, for as collections grow larger and more comprehensive the problems on which they may be brought to bear become broader and more far reaching.

Until recently, knowledge of the fauna of South America has depended upon scattered data gathered sporadically and variously isolated in different parts of the world. Detailed systematic study and explorations continued over a period of years opens up a host of problems not only in classification and distribution, but also in phylogeny, ecology, evolution and relations to human affairs. Especially in the study of mammals there is a wide field promising important results. No general work in the mammals of South America has even been attempted and there is scarcely a single genus of which the geographic distribution is known in detail. Ignorant of the facts of distribution, we are of course still far from a knowledge of their causes. Among problems of great interest are those dealing with the derivation of the fauna and recent work is throwing considerable light upon the relations of living and extinct types. From the economic standpoint, faunistic work in South America may prove to be of even greater importance than it has been in northern countries, as for example in the control of disease and in the advance delimitation of regions naturally suited for agricultural development.

The Corals and Coral Reefs of the Gulf of Mexico and the Caribbean Sea: Thomas Wayland Vaughan.

After calling attention to the three bathymetric zones represented by the corals in coral reef areas, the factors which determine the locus of corals of different growth facies in the shoal waters of such areas were indicated. The discussion of the factors determining the lower bathymetric limit of shoal water corals included an account of the relative capacity of corals to remove sediment from their surfaces, their mechanisms for catching food, the nature of their food and their relations to light and to temperature. The relations to salinity and atmospheric exposure were considered. Experiments on rearing corals, on the determination of the length of the free-swimming larval stage and on the growth rate of corals were described.

The relations of off-shore reefs to the submarine platforms around the Gulf of Mexico and the Caribbean Sea, viz., Mosquito Bank, Compeche Bank and the Floridian Plateau, and to the submerged terraces of the Virgin Islands, the Saint Martin Plateau and Antigua, were briefly discussed. It was shown that in Recent geologic time the margins of the Gulf of Mexico and the Caribbean Sea have been submerged by the sea overflowing the marginal land areas, which in Pleistocene time stood higher with reference to the sea-level than at present. Of the living off-shore reefs those of the continents have grown up on recently submerged or more deeply submerged

portions of the continental platforms, while those off the islands are growing upon submarine terrace flats which either stood above water level previous to the last submergence or which have undergone deeper submergence in Recent geologic time.

The Distribution of Igneous Rocks in South America: HENRY STEPHENS WASHINGTON.

The paper presented a very brief correlation between the distribution of petrographic provinces in North and South America. Our knowledge of the chemical petrography of the southern continent is very imperfect, but suffices to give some approximate ideas of some of the main features.

The lavas of the long line of huge Andean volcanoes belong, almost without exception, to very common and widely distributed types, dacites, andesites and basalts, which are, chemically, clustered around the average igneous rock, without prominent dominance of any one chemical constituent. These correspond to, and are a continuation of, the volcanic rocks of the Rocky Mountains and the Cordilleras, from Alaska to Panama. The central part of South America is scarcely known, but here, as in North America, there would seem to be few igneous rocks. Near the east coast, as in Brazil and Paraguay, are highly sodic rocks, corresponding to a similar zone parallel to the east coast of North America, from Ontario to Texas. There are also some indications in Brazil of rocks of a very distinct chemical type, like some found in Ellesmere Land, Ontario and New York. It would appear, therefore, that the two continents much resemble each other in the general distribution of the igneous rocks.

L. O. HOWARD,
Permanent Secretary

THE FEDERATION OF AMERICAN SOCIETIES FOR EXPERIMENTAL BIOLOGY

THE third annual meeting of the Federation formed by the American Physiological Society, the American Society of Biological Chemists, the American Society for Pharmacology and Experimental Therapeutics and the American Society for Experimental Pathology, was held in laboratories of the Harvard Medical School, Boston, on December 27, 28 and 29, 1915.

Only two joint sessions could be arranged, the large number of papers offered and the limited time forbidding other combined meetings. The first one was held on Monday morning, December 27, and this session opened the scientific meetings. The following papers were read and discussed:

Symposium: "Food Accessories." Discussion opened by T. B. Osborne and L. B. Mendel, E. V. McCollum, Carl Voegtlin.

"The Formation and Structure of the Fibrin-Gel," by W. H. Howell.

"Experiments on the Mechanism of Osmosis," by Jacques Loeb and Hardolph Wasteneys (by invitation).

"Further Observations on Over-activity of the Cervical Sympathetic," by W. B. Cannon and R. Fitz (by invitation).

"Some New Observations on the Uric Acid Content of the Blood," by Otto Folin and R. D. Bell (by invitation), with the assistance of G. Le B. Foster.

"On Continuous Insufflation Through the Humerus in Fowl," by A. L. Meyer (by invitation) and S. J. Meltzer.

"The Influence of the Adrenals on the Kidney," by E. K. Marshall and D. M. Davis (by invitation).

"Heredity and Internal Secretion in the Origin of Cancer in Mice," by Leo Loeb.

"The Effect of X-Rays on Cancer Immunity," by James B. Murphy.

"The Presence of Posterior Lobe Secretion in the Cerebro-spinal Fluid," by Harvey Cushing and Gilbert Horrax (by invitation).

The second joint session took place on Tuesday afternoon, December 27, and was devoted entirely to demonstrations. These demonstrations were given partly in a large amphitheater and partly in three laboratory rooms. The program was as follows:

DEMONSTRATIONS

"Demonstration of the Agglutination of Bacteria in Vivo," by Carroll G. Bull (by invitation).

"A Method of Obtaining Suspensions of Living Somatic Cells of the Higher Animals," by Peyton Rous and F. S. Jones (by invitation).

"Analogous Antagonistic Effects Exerted by Electrolysis and Anesthetics on Physical Systems and Living Cells," by G. H. A. Clowes.

"The Action Current of Glands," by W. B. Cannon and McKeen Cattell (by invitation).

"A New Type of String Galvanometer and Accessory Apparatus," by Horatio B. Williams.

"Apparatus for the Investigation of Cardiodynamics," by Robert Gesell.

"A Circulation Model," by A. L. Prince (by invitation).

"An Improved Slide for Blood Counting," by Theodore Hough.

"A Motor-driven Airblast Interruptor for Artificial Respiration," by W. B. Cannon.

"A Mine Rescue Breathing Apparatus," by Yandell Henderson.

"A Method of Studying Respiration in the Rat," by H. G. Barbour and L. L. Maurer (by invitation).

"Insufflation Through the Humerus in Fowl," by A. L. Meyer (by invitation), and S. J. Meltzer.

"A Simplified Procedure for the Determination of Carbon Dioxide Tension in the Alveolar Air," by W. McK. Marriott.

"A Quantitative Pump for Prolonged Intravenous Injections," by R. T. Woodyatt.

"Some New Apparatus," by D. E. Jackson.

"Apparatus for Recording Graphically the Movements of Melanophores," by Raymond Spaeth (by invitation).

"Further Studies on the Elective Localization of Streptococci," by Edward C. Rosenow.

"The Perfected 'Shadow Pupillometer,'" by George W. Fitz.

"A Simple Rheostat for Laboratory Use," by E. G. Martin.

"A Motor-driven Circuit Breaker," by E. G. Martin.

Executive Committee for the Year 1916: Chairman, Simon Flexner, secretary, Peyton Rous, for the Pathological Society; W. B. Cannon and C. W. Greene, the Physiological Society; Walter Jones and Stanley R. Benedict, the Biochemical Society; Reid Hunt and John Auer, the Pharmacological Society.

The next annual session of the Federation will be held in New York City, together with the American Association for the Advancement of Science.

J. Auer,
Secretary of the Executive Committee, 1915
Rockefeller Institute

THE AMERICAN SOCIETY FOR PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS

The seventh annual session of the Pharmacological Society was held in Boston at the Harvard Medical School on December 27, 28 and 29, 1915. Three sessions were independent and two were joint meetings with the other members of the federation.

The scientific sessions were opened on Monday morning, December 27, in accordance with custom, by a joint session of the four societies forming the federation. The papers read at this meeting will be found in the preceding account of the federation.

The first independent session was held on Monday afternoon and the following papers were read and discussed:

"The Effect of Drugs on Auricular Systole and Their Consequent Effect on Ventricular Efficiency," by C. J. Wiggers.

"A Study of the Potency of Digitalis Preparations," by J. H. Pratt and C. Wesselhoeft (by invitation).

"The Influence of Iodine on the Heart," by Wm. Salant and A. E. Livingston (by invitation). (Read by title.)

"The Effect of Certain Drugs on the Excised Uterus in Guinea-Pigs," by J. D. Pilcher.

"The Stability of the Growth-promoting Substance in Butter Fat," by Lafayette B. Mendel and T. B. Osborne.

"Studies on Lipoids," by W. H. Schultz. (Read by title.)

"Further Studies on Mustard Oil Inflammation," by S. Amberg, A. S. Loevenhart and W. B. McClure (by invitation).

"The Distribution of Trypan-red to the Tissues and Vessels of the Eye as Influenced by Congestion and Early Inflammation," by P. A. Lewis.

"Is the Pupil Dilatation from Adrenalin Following Gangliectomy Due to the Vasodilatation?" by T. S. Githens and S. J. Meltzer.

"The Absorption and Elimination of Different Dyes," by Wm. Salant and R. O. Bengis (by invitation). (Read by title.)

The second independent session was held on Tuesday morning, December 28, and the following papers were read and discussed:

"The Inhibition of the Toxicity of Anesthetics in the Nephropathic Kidney," by Wm. de B. MacNider.

"Morphological Changes in the Tissues of the Rabbit as a Result of Reduced Oxidations," by G. H. Martin (by invitation), C. H. Bunting and A. S. Loevenhart.

"Relation of the Hemolytic Power to the Surface Tension of Saponin Solutions," by E. Woodward (by invitation), and C. L. Alsberg. (Read by title.)

"Further Study of Nicotin Tolerance," by C. W. Edmunds and M. I. Smith (by invitation).

"Effects of the Prolonged Feeding of Aluminum," by George B. Roth and Carl Voegtlin.

"The Toxicity of Various Commercial Preparations of Emetin Hydrochloride," by L. G. Rowntree and R. L. Levy (by invitation).

"Further Observations on the Clinical Actions of Veratrum," by R. J. Collins (by invitation).

"The Detoxifying Action of Sodium Salts upon Potassium Salts on Intravenous Injection," by S. Amberg and H. F. Helmholtz.

"The Influence of Temperature on the Onset of Strychnine Convulsions in the Intact Frog," by B. H. Schlomowitz (by invitation) and C. S. Chase (by invitation).

"On the Action of Epinephrin and Papaverin on the Ureter," by David I. Macht (by invitation). (Presented by J. J. Abel.)

The third independent session was held on Wednesday morning, December 29, the Tuesday afternoon meeting being a joint session of the federation.

The following papers were presented and discussed:

"Salicyl in Blood and Joint Fluid of Individuals Receiving Full Therapeutic Doses of Salicylate," by R. W. Scott (by invitation), T. W. Thoburn (by invitation) and P. J. Hanzlik.

"Excretion of Salicyl in the Urine of Rheumatic and Non-Rheumatic Individuals," by R. W. Scott (by invitation), T. W. Thoburn (by invitation) and P. J. Hanzlik.

"Some Observations on the Elimination of Hexamethylenetetramin (Urotropin)," by K. George Falk and K. Sugiura (by invitation).

"Some Observations on Anesthesia and Analgesia," by D. E. Jackson.

"Paraoxyphenylethylamin as a Morphin Antagonist," by H. G. Barbour, L. L. Maurer (by invitation) and W. C. v. Glahn (by invitation).

"Action of Some Derivatives of Phenylethylamin," by H. G. Barbour.

"The Comparative Action of the Chief Alkaloids of Cinchona," by Worth Hale.

"The Fate of Sodium Citrate in the Body," by Wm. Salant and L. F. Wise (by invitation). (Read by title.)

"Further Studies on the Pharmacological Action of Oil of Chenopodium," by Wm. Salant and A. E. Livingston (by invitation). (Read by title.)

"Colorimetric Method for the Estimation of Free Formaldehyde," by R. J. Collins (by invitation), and P. J. Hanzlik.

"Salicyluric Acid," by P. J. Hanzlik.

"The Anesthetic Tension of Ether Vapor in Man," by W. M. Boothby (by invitation).

Officers for 1916: During the first executive session on Monday afternoon, December 27, the following officers for the year 1916 were elected:

President: Reid Hunt.

Secretary: J. Auer.

Treasurer: Wm. de B. MacNider.

Additional Members of the Council: A. D. Hirschfelder, George B. Roth.

Membership Committee: C. W. Edmunds (term expires 1918), Torald Sollmann (term expires 1916).

New Members.—During the second executive session held Tuesday morning, December 28, the following candidates for membership, who have been passed by the membership committee and the council were elected by the society.

Russel J. Collins, Western Reserve University Medical School.

J. F. Corbet, University of Minnesota.

O. Folin, Harvard Medical School.

R. J. Hoskins, Northwestern University Medical School.

Paul D. Lamson, Johns Hopkins Medical School.

Robert L. Levy, Johns Hopkins Medical School.

C. C. Lieb, Columbia University.

E. K. Marshall, Jr., Johns Hopkins Medical School.

David I. Macht, Johns Hopkins Medical School.

Louise Pearce, Rockefeller Institute.

Richard Weil, Cornell University Medical School.

At the close of this session a motion was made, seconded and unanimously carried, that a vote of thanks be extended to the Harvard authorities and to the local committee for their efforts which contributed largely to the success of the meetings.

Dinners.—Two informal subscription dinners were given on the evenings of December 27 and 28 at headquarters, the Hotel Lenox. At the first dinner the chairman of the federation, Dr. Sollmann, gave a brief review of the history of the federation and pointed out some possible future developments. The chairman then called upon Drs. W. B. Cannon and Walter Jones, who responded by pithy speeches.

Meeting Place for 1916.—The Pharmacological Society, together with the other members of the federation, will meet in New York City in 1916 with the American Association for the Advancement of Science.

J. AUER,
Secretary

ROCKEFELLER INSTITUTE,
January 6, 1916

THE AMERICAN PHYSIOLOGICAL SOCIETY

The twenty-eighth annual meeting of the American Physiological Society was held in conjunction with the constituent societies of the Federation of American Societies for Experimental Biology in the physiological laboratory of the Harvard Medical School, Boston, Mass., December 26 to 29, 1915. There was an unusually large attendance of the members. No less than 63 scientific papers, 23 demonstrations and 4 papers by titles were presented on the program.

The initial joint meeting with the biochemists, pharmacologists and pathologists Monday morning, the twenty-seventh, was opened by a symposium on "Food Accessories" in which the discussion was led by Drs. L. B. Mendel, E. V. MacCollum and Carl Voegtlin. The high scientific excellence of this first joint meeting is indicated by the list of names of participants, namely, W. H. Howell, Jacques Loeb, W. B. Cannon, Otto Folin, A. L. Meyer, E. K. Marshall, Leo Loeb, J. B. Murphy and Harvey Cushing.

The complete list of papers and demonstrations is as follows:

Symposium.—"Food Accessories." Discussion opened by T. B. Osborne and L. B. Mendel, Casimir Funk, E. V. McCollum, Carl Voegtlin.

"The Formation and Structure of the Fibrin Gel," by W. H. Howell.

"Experiments on the Mechanism of Osmosis," by Jacques Loeb.

"Further Observations on Over-activity of the Cervical Sympathetic," by W. B. Cannon and R. Fitz (by invitation).

"Some New Observations on the Uric Acid Content of the Blood," by Otto Folin and R. D. Bell (by invitation) with the assistance of G. Le B. Foster.

"On Continuous Insufflation Through the Humerus in Fowl," by A. L. Meyer (by invitation) and S. J. Meltzer.

"The Influence of the Adrenals on the Kidney," by E. K. Marshall and D. M. Davis (by invitation).

"Heredity and Internal Secretion in the Origin of Cancer in Mice," by Leo Loeb.

"The Effect of X-rays on Cancer Immunity," by James B. Murphy.

"The Presence of Posterior Lobe Secretion in the Cerebro-spinal Fluid," by Harvey Cushing and Gilbert Horrax (by invitation).

"The Influence of Gastrectomy on Subsequent Pancreatectomy in Dogs," by J. R. Murlin and J. E. Sweet.

"The Distribution of Suprarenin-yielding Tissue in Different Animals," by M. E. Fulk (by invitation) and J. J. R. Macleod.

"The Action of Minimal Doses of Adrenalin," by Walter J. Meek.

"The Effects of Suprarenal Feeding on the White Rat," by R. G. Hoskins and Augusta D. Hoskins (by invitation).

"Adrenalin Content of the Blood in Conditions of Low Blood Pressure and 'Shock,'" by E. A. Bedford (by invitation), and H. C. Jackson.

"Rhythmical Changes in the Resistance of Dividing Sea-urchin Eggs to Hypotonic Sea-water," by Ralph S. Lillie.

"Mass-action in the Activating Effect of Butyric Acid on Unfertilized Starfish Eggs," by Ralph S. Lillie.

"The Permeability of Animal and Plant Cells," by W. J. V. Osterhout.

"On the Rôle Played by Electrolytes in Determining the Permeability of Protoplasm," by G. H. A. Clowes.

"Three Types of Muscular Response in Sea-anemones," by G. H. Parker.

"The Relation of Certain Muscles to Oxygen," by F. S. Lee, A. E. Guenther and H. E. Meleney (by invitation).

"Influences Affecting Voluntary Muscular Work—Especially Age and Tobacco," by Warren P. Lombard.

"The Function of the Kidney When Deprived of its Nerves," by Wm. C. Quinby.

"Electrocardiographic Studies in Normal Infants," by Edward B. Krumbhaar.

"The Time Relations of Auricular Systole," by C. J. Wiggers.

"The Movements of the Mitral Valves in Relation to Auricular and Ventricular Systoles," by A. L. Dean (by invitation).

"Further Researches on the Relation of the Chronotropic Action of the Vagus to the Nodal Tissues," by H. Steenbock, J. A. E. Eyster and Walter J. Meek.

"The Tension of Carbon Dioxide and Oxygen in Venous Blood at Rest and at Work," by W. M. Boothby (by invitation) and I. Sandiford (by invitation).

"The Chief Physical Mechanisms Concerned in Clinical Methods of Measuring Blood-pressure," by Clyde Brooks and A. B. Luckhart.

"Haemodynamical Studies," by R. Burton-Opitz.

"The Mechanism of the Arterial Compression Sounds of Korotkoff," by Joseph Erlanger.

"The Responses of the Vaso-motor Mechanism to Different Rates of Stimulation," by Charles M. Gruber.

"Vaso-motor Summations," by E. G. Martin and P. G. Stiles.

"Blood Changes Following Hæmorrhage and Infusion," by Theodore Hough and J. A. Waddell (by invitation).

"Experimental and Clinical Studies on Mental Defectives. III. The Relation of Systolic and Diastolic Blood Pressures and Their Power of Adjustment to Body Position," by A. W. Peters and C. D. Blackburn (by invitation).

"Prolonged Uniform Intravenous Injections," (lantern), by R. T. Woodyatt.

"The Deglutition Center in the Medulla Oblongata," by F. R. Miller.

"Demonstration of the Agglutination of Bacteria in Vivo," by Carroll G. Bull (by invitation).

"A Method of Obtaining Suspensions of Living Somatic Cells of the Higher Animals," by Peyton Rous and F. S. Jones (by invitation).

"Analogous Antagonistic Effects Exerted by Electrolysis and Anesthetics on Physical Systems and Living Cells," by G. H. A. Clowes.

"The Action Current of Glands," by W. B. Cannon and McKeen Cattell (by invitation).

"A New Type of String Galvanometer and Accessory Apparatus," by Horatio B. Williams.

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"A Simplified Procedure for the Determination of Carbon Dioxide Tension in the Alveolar Air," by W. McK. Marriott.

"A Quantitative Pump for Prolonged Intravenous Injections," by R. T. Woodyatt.

"Some New Apparatus," by D. E. Jackson.

"Apparatus for Recording Graphically the Movements of Melanophores," by Raymond Spaeth (by invitation).

"Further Studies on the Elective Localization of Streptococci," by Edward C. Rosenow.

"On Nephelometric Methods; Reagents for the Estimation of Proteins, Nucleic Acids, Purin Bases, Uric Acid, Phosphorus and Ammonia (Graves' Reagent)," by P. A. Kober.

"The Perfected 'Shadow Pupillometer,'" by George W. Fitz.

"A Simple Rheostat for Laboratory Use," by E. G. Martin.

"A Motor Driven Circuit Breaker," by E. G. Martin.

"The Mode of Action of Ultra-violet Radiation in Destroying Hormones, Proenzymes, Enzymes and Living Cells," by W. E. Burge.

"Initial Length, Initial Tension and Tone of Auricular Muscle in Relation to Myo- and Cardiodynamics," by Robert Gesell.

"Is the Contraction of Smooth Muscle Accompanied by Heat-production?" (second communication), by C. D. Snyder.

"The Experiment of Valsalva," by Percy M. Dawson and P. C. Hodges (by invitation).

"Comparative Studies in the Physiology of the Gastric Hunger Contractions in the Amphibia and the Reptilia," by T. L. Patterson (by invitation).

"Localization by Faradic Stimulation in the Floor of the Fourth Ventricle," by F. R. Miller.

"Direct Evidence of Duodenal Regurgitation and its Influence upon the Chemistry and Function of the Normal Human Stomach," by W. H. Spencer (by invitation), G. P. Meyer (by invitation), and P. B. Hawk.

"The Diuretic Action of Tissue Extracts," by Frank P. Knowlton.

"The Appearance of Sugar in the Digestive Secretions in Phloridzin Glycosuria," by Roy G. Pearce.

"The Rapidity with which Alcohol and Some Sugars are Available as Nutriment," by H. L. Higgins.

"Some Results of Studies on Electrical Changes in Glands," by W. B. Cannon and McKeen Cattell (by invitation).

"The Action of the Depressor Nerve on the Pupil," by J. Auer.

"Evidence Showing the Metaphore to be a Disguised Type of Smooth Muscle," by Raymond Spaeth (by invitation).

"The Voluntary Innervation of Skeletal Muscle," by E. G. Martin and R. W. Lovett (by invitation).

"Comparison of the Chemical Changes in the

Central Nervous System in Pellagra and in Animals on an Exclusive Vegetable Diet,'' by M. L. Koch (by invitation), and Carl Voegtlin.

''A Study of a Lecithin-glucose Preparation,'' by Ernest L. Scott.

''Effect of Excluding Pancreatic Secretion from the Intestine on the Absorption of Nitrogen and Fat,'' by Joseph H. Pratt.

''The Fat of the Blood in Relation to Heat-production, Narcosis and Muscular Work,'' by J. R. Murlin and J. A. Riche (by invitation).

''The Fat and Lipase Content in the Blood in Relation to Fat Feeding and to Fasting,'' by C. W. Greene and W. S. Summers (by invitation).

''Some Practical Applications of Feeding Experiments with Albino Rats,'' by Thomas B. Osborne and Lafayette B. Mendel.

''The Influence of Chemical Substances on Immune Reactions, with Special Reference to Oxidation,'' by Aaron Arkin.

''The Effect of Thyro-parathyroidectomy on the Blood Coagulation Time in the Dog,'' by Sutherland Simpson and A. T. Rasmussen (by invitation).

''Detection with the String Galvanometer of Afferent Impulses in the Brain-stem and Their Abolition with Ether Anesthesia,'' by A. Forbes and R. H. Miller (by invitation).

''A Smooth-muscle Nerve Preparation,'' by C. D. Snyder.

''Cinematograph and Lantern Demonstration of Some Effects of Lesions of the Nervous System,'' by F. H. Pike.

''On the Secretory Discharge of the Pituitary Body Produced by Stimulation of the Superior Cervical Ganglion,'' by V. N. Shamoff (by invitation).

''Concerning the Action of Various Pituitary Extracts on the Isolated Intestinal Loop,'' by V. N. Shamoff (by invitation).

''The Influence of Certain Cereal Foods on the Gastric Secretion,'' by C. C. Fowler (by invitation), M. E. Rehfuss (by invitation), and P. B. Hawk.

''Changes in the Composition of the Body of Fasting Lobsters,'' by Sergius Morgulis.

''A Note on the Contractility of the Musculature of Auriculo-ventricular Valves,'' by Joseph Erlanger.

''The Psychic Secretion of Gastric Juice,'' by R. J. Miller (by invitation), M. E. Rehfuss (by invitation), and P. B. Hawk.

Notwithstanding the limited time of fifteen minutes allowed for each paper and its discussion, there was sustained interest in the meetings throughout the six sessions. This was contributed to in no small part by the vigorous discussions. The secretary feels that this was one of the most fruitful features characterizing the meetings.

Of the business transactions the most important to the progress of physiological science was the vote to collaborate with the British Physiological Society in the publication of ''Physiological Abstracts.'' It was the feeling that the society owed it to the younger physiologists and to the ever-growing fields of practical research in the subject to make the results of physiological investigation available in the English language.

The Council reported an unusually prosperous year in the publication of the *American Journal of Physiology*, and it was recommended and the society voted to take steps to increase the circulation of the *Journal*, especially among the membership. The hope was expressed that an increased circulation would make possible both a reduction in the cost per volume of the *Journal* to members and an increase in the size of the volumes.

An unusual number of new members were elected as follows: Walter R. Bloor and Walter M. Boothby, Harvard Medical School; Thornton M. Carpenter, Nutrition Laboratory of the Carnegie Institution; George H. Baitsell, A. L. Prince and Reynold A. Spaeth, Yale University; T. S. Githers, Rockefeller Institute; Edward C. Day, Syracuse University; C. K. Drinker, Katherine R. Drinker, E. K. Marshall, George Peirce and D. W. Wilson, Johns Hopkins University; N. R. Blatherwick, Department of Agriculture, Washington; Herbert S. Gasser, University of Wisconsin; Addison Gulick, University of Missouri; C. W. Hooper, Hooper Foundation, San Francisco; Benjamin Kramer, University of Iowa; Walter L. Mendenhall, Dartmouth College; Maud L. Menton, Barnard Skin and Cancer Hospital, St. Louis; S. W. Ranson, Northwestern University.

The officers elected for the ensuing year are: *President*, W. B. Cannon; *Secretary*, C. W. Greene; *Treasurer*, Joseph Erlanger; *Member of the Council for 1916–1919*, W. J. Meek.

A hopeful feature of the meeting was the fact that the attendance persisted through the entire series of six sessions, a fact that was contributed to in no small measure by the active cooperation and boundless hospitality of the ''Local Committee.''

Chas. W. Greene,
Secretary

University of Missouri,
January, 1916